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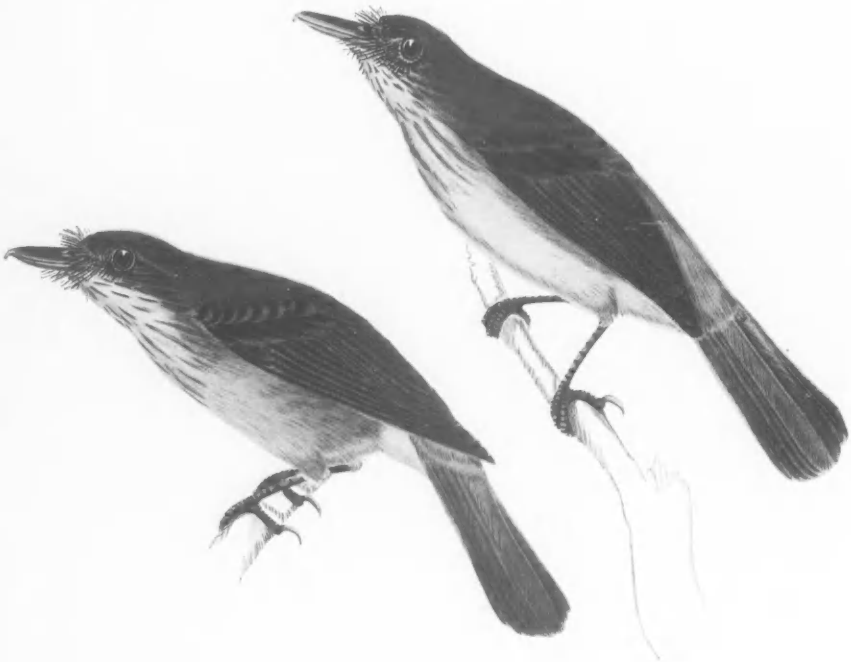

POLYMORPHIC ATTILA

ATTILA SPADICEUS

Two-thirds natural size

Painting by Andrew Jackson Grayson

THE CONDOR

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SOME ECOLOGICAL RELATIONS OF CHICKADEES AND TITMICE IN CENTRAL CALIFORNIA

By KEITH L. DIXON

Within recent years the Chestnut-backed Chickadee (*Parus rufescens*) has extended its range interiorward in the San Francisco Bay region of central California and has come to occupy areas in which the Plain Titmouse (*Parus inornatus*) previously was the sole representative of the genus *Parus*. This case is of special interest since studies of the Plain Titmouse were made at one locality prior to the influx of the chickadees (Dixon, 1949). Some of the interrelations of the two species will be considered following a review of the changes in the distribution of the chickadee.

The geographic range of *Parus rufescens barlowi*, the form concerned, was described by Grinnell and Miller (1944:304) as "Essentially, Santa Cruz faunal area; that is, narrow central coast belt south from Golden Gate and San Francisco Bay as far as Cambria, San Luis Obispo County. Eastward margin of range scarcely reaches western shore of south arm of San Francisco Bay near San Mateo and Palo Alto; in later years seen regularly in and about San Jose, where they breed (D. McLean, MS)." At the time of their writing, this chickadee was considered a vagrant in the "East Bay district." Subsequently, stocks of *Parus rufescens* became established as permanent residents in Oakland, Berkeley, and adjacent localities.

The early pattern of occurrence of this species in East Bay localities is indicated by the following published records.

Several seen at Hayward, Alameda County, December 8, 1885; one taken at Dry Creek, August 1, 1896 (Emerson, 1900).

Lone individual at Berkeley, Alameda County, "one Thanksgiving time" during the latter 1890's (Miller, 1950:34).

One individual at Berkeley, October 13 to 25, 1913 (Grinnell, 1914).

Alvarado, Alameda County, was included by Grinnell (1904:380) in a list of localities from which specimens had been examined. He pointed out (p. 374) that all records from that county were for the autumn months and suggested that they represented wandering juveniles.

Grinnell and Wythe (1927:144) listed the status of this chickadee in the area of our concern as "a rare straggler, once at Berkeley and a few times at Hayward."

A different status was ascribed to this species by Cohen (1895:157) in his report on the birds of Alameda County. He stated that "The California Chickadee prefers to breed in the most unsettled portions of the county, and is not a common bird." Cohen cited no locality records.

Further records of the occurrence of this chickadee in the area east of San Francisco Bay prior to 1938 are not known to me. On April 17, 1938, the late Henry W. Carriger observed a pair of chickadees nest-prospecting along a creek near Sunol, Alameda County. He took a set of five fresh eggs near Niles, Alameda County, on April 12, 1940, and noted nesting in the vicinity of Sunol in 1940, 1942, and 1946. I am indebted to Leroy Jensen for making Mr. Carriger's unpublished observations available.

Subsequently Chestnut-backed Chickadees spread to the northwestward. They were observed in Redwood Park, Alameda County, on July 11, 1943, according to Elwonger (1943:33). By the spring of 1945 chickadees were nesting along Wildcat Creek in Tilden Park, Contra Costa County (A. H. Miller, MS). Juvenal and adult specimens characteristic of *P. r. barlowi* were obtained by J. T. Marshall, Jr., along San Leandro Creek, Alameda County, on June 29, 1946. Marshall (MS) also saw one chickadee on the University of California campus in Berkeley on July 1, 1946. A few other observations were made on the west slope of the Berkeley Hills in subsequent years, but I know of no evidence of the nesting of chickadees in the vicinity of Berkeley prior to 1950. On May 6 of that year, Harrison Ryker and I located a nest in a California laurel (*Umbellularia*) along Strawberry Creek on the lower part of the campus of the University of California. The parents were bringing food to the nestlings. In each succeeding year, reports of various observers indicated a wider distribution of Chestnut-backed Chickadees in East Bay cities during the breeding season.

The Berkeley area, lying directly opposite the Golden Gate, long has been known as an "island" of conditions approaching those of the Transition Life-zone which is set in warmer and more arid surroundings. Grinnell (1914:29) commented upon "a marked Transition or even Boreal infusion noticeable particularly in the summer-visitant category of birds." Commenting on the occurrence of *Parus rufescens* in Berkeley, Grinnell (*op. cit.*:39) remarked as follows: "Judging from the climatic peculiarities of the immediate vicinity of Berkeley, it would appear consistent with our knowledge of geographical distribution to expect that, with the aging of our planted groves of conifers, chickadees will find conditions favorable to the establishment of permanent colonies, as with the Olive-sided Flycatcher and other boreal, and at the same time, aboreal (sic), species."

Prior to the settlement of California by the white man, vegetational discontinuities in the Santa Clara Valley possibly presented a barrier to the eastward dispersal of these tree-dwelling birds. Broek (1932:29) cited accounts of Spanish explorers of the 18th century who found that much of the floor of the valley was covered by a "park-like, grass-oak association." The spread of the chickadee into the vicinity of San Jose, as mentioned, may have been facilitated by plantings of orchards and of shade trees. The observation of Pitelka (1941) of a pair of *P. r. neglectus* in a grove at Bodega Bay, California, three-fourths of a mile from the nearest woods, suggests that continuous arboreal cover is not necessary for dispersal of this species of chickadee. Individuals may have crossed the Santa Clara Valley occasionally under primitive conditions as well as in later years. The expansion of fruit orchards in the valley, which continued during the 1920's (Broek, 1932:109), may have permitted greater numbers of chickadees to cross the Santa Clara Valley to the Diablo Range to the east. Well-wooded canyons, such as those lying alongside Sunol Ridge, provided suitable breeding habitat for this species. The expanding population of chickadees could have spread to the northwest by way of shaded slopes or riparian timber. Had a population existed there 50 or 60 years ago, as suggested by Cohen (1895) and Emerson (1900), the dispersal into the Berkeley area doubtless would have occurred much earlier than it did.

The East Bay district into which *Parus rufescens* spread is characterized by the presence of summer sea fogs (Byers, 1930). The fogs (actually a stratus cloud layer) blanket this area to varying degrees during the forenoon and effect a reduction in summer insolation. The present eastern limit of the distribution of the chickadees coincides closely with the limits of summer sea fog distribution as mapped by Byers, a relationship pointing again to a similarity in the climates of the Berkeley area and the humid coast district.

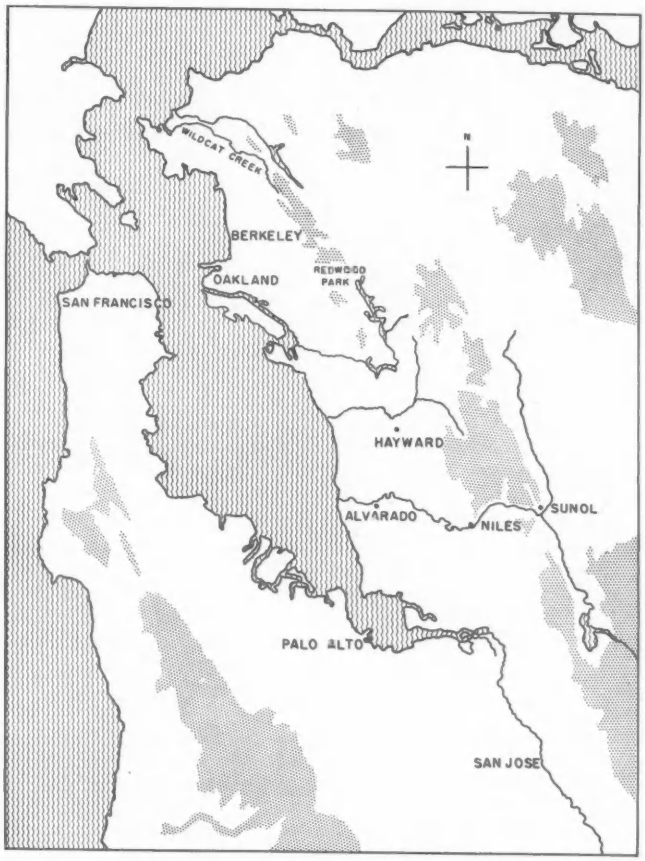

Fig. 1. Map of the San Francisco Bay region showing localities mentioned in the discussion of Chestnut-backed Chickadees. Stippling indicates areas over 1000 feet in elevation.

THE QUESTION OF COMPETITION BETWEEN CHESTNUT-BACKED CHICKADEE AND PLAIN TITMOUSE

The entry of the Chestnut-backed Chickadee into the bird fauna of the Berkeley Hills is of interest with respect to possible interactions with its congener, the Plain Titmouse. The ranges of these two nonmigratory species are distinct for the most part, the titmouse being characteristic of drier interior localities (see Grinnell and Wythe, 1927: 143-144). Grinnell (1904:375) noted habitat segregation of the two species at Palo Alto, the chickadees frequenting planted groves of conifers and the titmice being found principally in live oak groves. He suggested that further expansion of the range of

Parus rufescens interiorward might be halted by food relations with other small birds, such as Wren-tits (*Chamaea fasciata*) or the Plain Titmouse.

More recently, Lack (1944) and Snow (1949) have stressed the importance of adjustments in behavior, especially feeding, if two similar forms are to coexist in the same area. Coöccupancy of an area by two species of similar ecology might provide tensions in two spheres of activity, namely feeding relations and spatial needs, especially as related to reproduction.

Table 1

Food-taking Motions of Chickadees and Titmice
November-December, 1951

Parus rufescens

	Trunk	Branch	Twigs	Foliage	Fruit	Total	Per cent
Eucalyptus	11	82	7	14	82	196	33.3
Laurel	8	68	35	80	....	191	32.5
Live oak	1	....	10	65	....	76	12.9
Other trees	10	8	58	36	13	125	21.9
Ground	....	....	....	....	....	0	0
Total	30	158	110	195	95	588	100
Per cent	5.1	26.9	18.7	33.1	16.2	100	

Parus inornatus

Eucalyptus	14	17	17	2	...	50	13.3
Laurel	7	3	5	....	....	15	3.9
Live oak	9	6	23	159	7	204	54.2
Other trees	5	11	14	20	....	50	13.3
Ground	....	....	....	....	57	57	15.3
Total	35	37	59	181	64	376	100
Per cent	9.3	9.8	15.7	48.2	17.0	100	

Possible overlap in foraging.—Although the two species share acrobatic capabilities in food seeking in arboreal situations, the Plain Titmouse differs from the chickadee in size and in bill structure. The bill of the titmouse is more massive (depth of bill at nostril averages 4.8 mm. in 10 males of *P. i. inornatus*; in 10 males of *P. rufescens* it averages 3.5 mm.). This morphologic difference is reflected in the ability of the titmice to break acorns apart by repeated hammering with the bill. The titmouse is larger, 12 winter-taken males of *P. i. inornatus* (Museum of Vertebrate Zoology) averaging 16.6 grams, in contrast to 9.7 grams for 15 males of *P. rufescens* from central California.

Snow (1949) demonstrated that in Sweden each of six species of *Parus* had distinct foraging sites when occurring together in the same forest. His method of approaching the problem was to record the species of tree and the height and position in the tree for each foraging observation of each of the species of *Parus*.

A similar method of gathering data for analysis of possible overlap in feeding habits of passerine birds was suggested to me in 1948 by Dr. Frank A. Pitelka, whose advice is gratefully acknowledged. Certain data were recorded for each motion apparently made to take a food item. These included kind of tree, height in the tree of the foraging individual, and whether foraging was carried out on trunk, branches, twigs, foliage or fruit of the tree. Twigs were designated arbitrarily as those branchlets less than one-half inch in diameter.

Observations of food-taking motions were made along Wildcat Creek, Contra Costa County, California, on two days in November, 1951, and on the campus of the University of California, Berkeley, on three days in November and eight days in December, 1951. These data are presented in table 1. The principal trees at the two localities were two indigenous evergreens, the live oak (*Quercus agrifolia*) and the California laurel (*Umbellularia californica*), and introduced evergreens of the genus *Eucalyptus*. There were scattered individuals of buckeye (*Aesculus*), maple (*Acer*), and willow (*Salix*),

Table 2

Food-taking Motions of Chickadees and Titmice
May, 1952

Parus rufescens

	Trunk	Branch	Twigs	Foliage	Fruit	Total	Per cent
Eucalyptus	....	....	....	....	1	1	0.8
Laurel	....	2	....	5	....	7	4.7
Live oak	....	47	20	60	1	128	86.4
Other trees	....	....	....	12	....	12	8.1
Ground	....	....	....	....	....	0	0
Total	0	49	20	77	2	148	100
Per cent	0	33.1	13.5	52.0	1.4	100	

Parus inornatus

Eucalyptus	....	....	2	2	1	5	9.2
Laurel	....	....	....	9	....	9	16.6
Live oak	....	....	....	19	....	19	35.2
Other trees	....	....	2	17	2	21	39.0
Ground	....	....	....	....	....	0	0
Total	0	0	4	47	3	54	100
Per cent	0	0	7.4	87.4	5.2	100	

and several species of introduced trees and shrubs. Chickadees and titmice were present concurrently in both areas. In May, 1952, observations were made on the University Campus on nine days during which time both species were feeding broods several days out of their nests (table 2).

No appreciable differences in feeding heights were noted and the data are not included since it is felt that they reflect merely the heights of the trees in which foraging was being done. A notable exception was the food-gathering of the Plain Titmouse on bare ground beneath the trees, an activity never observed in chickadees.

Minimal activity of arthropods would be expected during November and December so that the observations made at that time approached the condition which Crombie (1947:46) described as a high ratio of population to resources of the environment. If competition occurs, it would be expected under such conditions. Several points are revealed in a study of the data for this period (table 1). About two-thirds of the foraging time of the chickadees was spent in the aromatic eucalyptus and laurels in contrast to only one-sixth of the total time for the titmouse. The bark of the laurel trees lacks deep furrows which might harbor larger arthoropods and the bark of most eucalyptus species likewise is rather smooth. The bark of some of the species of eucalyptus sometimes peels in strips which tend to curl and afford hiding places for arthropods. Titmice have been seen searching for food in such sites. The titmice spent nearly one-half the observed time foraging on foliage of evergreen oaks. This was almost four times the percentage

spent by the chickadees. Nearly one-sixth of the titmouse foraging was done on the ground, principally on the fruits of an unidentified ornamental tree. Chickadees were never observed seeking food on the ground.

Differences in techniques of obtaining food items were evident during the winter season. In addition to splitting open hard-shelled fruits with their bills, the titmice would on occasion chip away the bark of a tree with their bills, apparently exposing inactive arthropods. Chickadees in contrast were seen picking repeatedly but daintily at the bark of laurel trees or the fruits of eucalyptus as though gleaning relatively small, but numerous, food items.

Vegetable matter made up 84 per cent of the food of 39 specimens of *P. inornatus* taken in California in winter, according to Martin, Zim and Nelson (1951:140). The same authors reported that only 40 per cent of the winter food of 24 specimens of *P. rufescens* from the Pacific Coast consisted of vegetable material. Overlap between the two species in animal food taken in the winter season is only partial, judging from my observations of food-taking motions. The animal matter in the diet of the titmouse in winter may include arthropods too large or too deeply buried in furrows of the bark to be accessible to the chickadees.

It is evident from the samples for May (table 2) that both species foraged on leaf surfaces, although the sites within the trees used by the chickadees were more varied. Since most of the prey animals were in the active, feeding stage, an abundance of them in the foliage is to be expected. The chickadees spent an overwhelming percentage of their foraging time in live oaks in contrast to the several species of trees frequented by the titmice. Neither species was seen foraging on the ground at this season. Although both parids searched leaf surfaces for food for themselves and their broods and took many insect larvae, it was evident on many occasions that the titmice took larger prey items. Often these were larvae of Lepidoptera which the adults tore into strips before offering them to their offspring.

Closer comparison of the percentages of overlap than that given is not considered warranted since data on the foraging sites of other small passerines from the same habitats are not available. However, because the two parids have acrobatic foraging capabilities, which permit them to search the undersides of branches, they should be in closer competition with one another than with other small birds seeking the same kinds of foods. The considerable differences in feeding habits in winter and differences in the size of food items taken during the breeding season, as well as the disparity in size, bear out the contention of Lack (1944:274) that closely-related species of birds occurring in the same region and habitat, usually differ in feeding habits and/or in size.

Overlap in space needs.—Closely related species of birds living in the same locality usually occupy different habitats (Lack, *loc. cit.*), competition between the two forms thus being reduced. Substantiation for this conclusion is provided by cases in which the ecological distribution of a given species is wider in the absence of a congeneric species than it is in similar areas in which both forms are present. Svardson (1949:160) discussed some examples of this phenomenon among parids in Sweden. In districts where the Marsh Tit (*Parus palustris*) occurred, the Willow Tit (Black-capped Chickadee; *P. atricapillus*) was found chiefly in conifers. Farther north, in the absence of the Marsh Tit, the Willow Tit ranged more widely. Even though the morphologic differences between the Chestnut-backed Chickadee and Plain Titmouse are greater than those between the Willow and Marsh tits, some separation in the ecological distributions of the former may be expected. These may be inferred form the fact that the titmouse is found in drier interior localities. Conditions favoring the chickadee in the East Bay district appear to exist chiefly along stream courses in the broader canyons east of the Berkeley

Hills. Titmice are found most often in groves of live oaks on sunny slopes. On the western slope of the Berkeley Hills, the riparian habitat is discontinuous and is not extensive, due perhaps to the steep gradient in stream flow and to disturbance by man. The preferred habitats of the two parids do not therefore exist in large blocs, but are intermingled in a mosaic, so that at some localities, at least, the two species can be considered as occupying the same habitat. An exception may be cited in that groves of eucalyptus and conifers are little used by titmice but are inhabited to a considerable extent at some seasons by chickadees.

The observations reported beyond were made as opportunity permitted me to be afield in Strawberry Canyon and on the lower part of the campus of the University of California, Berkeley. The period covered is from early in 1947 until May, 1952. Some of the data on which conclusions expressed in this paper were based will be presented in a separate paper relating to a population of the Plain Titmouse.

Some competition for nest sites between chickadees and titmice might be expected, for both nest in cavities. I have not observed *rufuscens* and *inornatus* quarreling over nest sites, but I have observed antagonism at other times of the year, indicating that friction between the two is not restricted to the breeding season. Such incidents occurred with greater frequency than the occasional clashes of the titmouse with other small passerines, such as the Oregon Junco. The encounters between the two parids might be examined with reference to the concept of interspecific territorialism as discussed by Simmons (1951). He recommended (p. 407) that the use of the term be restricted to cases involving species of overlapping ecology and pointed out that definite patterns of behavior were involved. He wrote as follows: "A territory holder of one species exhibits persistent aggressive behavior to an intruding bird of a second species, showing to it some, if not all, the reactions usually forthcoming in intraspecific encounters. Aggression is related to the territory as a whole and not merely to a particular part of it." Thus disputes relating solely to nest cavities are excluded from the discussion.

Our knowledge of the pattern of territorial behavior in *Parus rufescens* is fragmentary. Bowles (1909:55) reported a nesting "colony" of chickadees in western Washington in which seven occupied nests were closely spaced in what appeared to be optimal habitat for the species. Some of the nests were no more than 50 yards apart, from which observation weak territoriality may be inferred. In the Berkeley Hills, Chestnut-backed Chickadees travel in small flocks from early June until late February. I did not note restriction of chickadees to a territory except during a brief period in spring and I saw little indication of stringent territorial patterns.

Bowles (*op. cit.*) described a song of the chickadee, similar to that of the Chipping Sparrow (*Spizella passerina*) and given only during the spring months. On one occasion I recorded this song as a series of notes of one pitch, *chip chip chi chi chi chi chip,* accelerated progressively until the last note. I have not noted the use of this song in announcement of occupancy of an area, possibly because I have had little opportunity to study *rufescens* early in the breeding cycle. However, I heard this song used on several occasions in summer and early autumn. It was uttered by chickadees pursued by other birds, usually by titmice but once by an Anna Hummingbird (*Calypte anna*), and in intraspecific encounters in late summer. This "song" may correspond to the fighting note of the Black-capped Chickadee (Odum, 1942:502).

In contrast to the chickadees, Plain Titmice in coastal California defend their territories rather vigorously against intruders of their species throughout the year (Dixon, 1949:117). The principal means of announcement of occupancy of an area is the two-syllabled "whistled" song of the male; the variety of call notes common to both sexes serve to a lesser extent. Another song of *inornatus* heard on a very few occasions is a

succession of dry notes very similar to the song of *rufescens* just described. Singing is noticeable from February to May, but it may be evoked in times of stress in other seasons.

A tabulation of observed encounters between *rufescens* and *inornatus* is here presented. Some elements may be entered separately although they represent successively higher levels of response in the same encounter. For example, pursuit might follow an exchange of calls.

Both species present, no antagonism evident (March 12, June 4, June 11)	3
Chickadees with brood left area when titmouse family group appeared (May 29)	1
Chickadee and titmouse exchanged call notes alternately, obviously in response to one another (March 3, May 20, May 29, June 5, Sept. 14, Oct. 13, November 13, 18, December 10)	9
Titmouse scolded chickadee while the latter was calling (May 19, August 25)	2
Titmouse sang in response to call notes of chickadee (March 12, August 25)	2
Chickadee called as titmouse sang (March 24)	1
Chickadee sang as titmouse attempted to drive it from the area (July 20, November 21)	2
Titmouse displaced chickadee from its perch (July 20, December 9)	2
Titmouse pursued chickadee, the latter taking flight (March 12, July 20, November 21)	3

The responses of titmice toward chickadees included call notes and scolds, song, and pursuit—the full range in kind if not intensity of activities characteristic of intraspecific encounters. In contrast, the chickadees called and sang in quarreling with titmice but did not initiate pursuit and always gave way to their larger adversaries.

In 14 of 21 separate encounters, the friction observed between the two species was initiated by vocal contact. The general call notes, a scratchy *sicka dee dee* of *inornatus* and a wiry *zi zi zi zit* of *rufescens*, are similar in rhythm to an extent that either appears to function as a releaser to the individuals of the other species. Exchange of the closely similar (trilled) songs was not heard, although in one encounter (October 6, 1950) I was not able to determine whether the song was given by a chickadee or a titmouse. Simmons (*op. cit.*) stated that characters at the group level were important in eliciting interspecific territorial responses, citing general outline and mannerisms as most effective in the wintering oenanthid chats (avian family Turdidae) which he had studied. The quarrels between the titmice and chickadees appear clearly related to space occupancy (see beyond) but voice is the critical behavior element involved. Vocality is prominent in connection with social organization in the genus *Parus* and the basic vocal patterns appear to be retained with few modifications in many species of the genus.

Since most of the antagonism shown began with vocal exchange and since the combined populations of the two species is greatest in summer, more friction might be expected then. The aggressive responses of sedentary titmouse pairs at that season toward more mobile groups of chickadees is characteristic of the intraspecific year-around territorial defense exhibited by the titmouse. However, disputes in early spring would be more significant in relation to available space for breeding territories. A few episodes in a sequence of encounters between a pair of chickadees and an established pair of titmice was seen on the campus of the University of California in 1952. Calls were exchanged on March 3, but no further animosity was shown. On March 12, one member of a chickadee pair gave a general call to each group of whistled songs of the titmouse and was driven from the area by the titmouse shortly afterward. This action of the chickadee involved recognition of the song of the titmouse, possibly learned during interspecific combat. (A similar incident, involving different individuals, was witnessed at a locality nearly a mile away on March 24.) Subsequently, the chickadee withdrew to an adjacent portion of the campus, partly screened from the titmouse territory by a large, five-story building.

Although other incidents were not witnessed, the results are evident in the spatial separation of *inornatus* and *rufescens* in the vicinity of Berkeley in spring. Several illustrations follow:

A cavity in a eucalyptus tree alongside Wildcat Creek in Tilden Park, Contra Costa County, was used as a nest site by *rufescens* for five years, 1945–1949. From 1950 through 1952 the same cavity was used by *inornatus* (A. H. Miller, MS). In May, 1949, I observed a male *inornatus* singing in the territory to the north of the chickadee nest.

The chickadee nest which was discovered on the University of California campus on May 6, 1950 (page 114) was in an area occupied by *inornatus* in 1948 and 1951 but not in 1950.

On May 5, 1952, the pair of chickadees involved in the dispute with the titmouse on March 12 was feeding nestlings in a Cliff Swallow (*Petrochelidon pyrrhonota*) nest at the fifth story level on the north side of the Life Sciences Building, University of California. Trees were scattered and chickadees had to fly considerable distances from the nest to forage. Titmice had nested nearby in 1950, but not in 1951 or 1952, the banded occupant of the area in 1950 having moved to an adjacent territory. Titmice have nested in abandoned swallow nests on the south side of the same building repeatedly but to my knowledge have not occupied such sites on the shaded north side of the building.

The one case of nesting of chickadees in the special study area for *inornatus* was in a narrow strip of timber in a side draw of Strawberry Canyon. That draw was a part of a titmouse territory in 1947 but it never was used by titmice in the succeeding five nesting seasons.

In each of the cases cited, the territories of the two species were mutually exclusive. Some of the territories were used first by one species and then the other, pointing to the similarity in their habitat relations and again to mutual exclusion in spatial occupancy. The data of Norris (1952) suggest a territory size of not more than three acres on an average for *rufescens* in coastal pine forest. Plain Titmouse territories in live oak woodland are somewhat larger, 11 territories averaging 5.7 acres (Dixon, MS). Although the spatial needs of chickadee pairs may be less than those of titmice, the observation that the titmouse territories in Strawberry Canyon seldom contained more than one suitable nest site (Dixon, 1949:125), indicates that only under exceptional circumstances would a pair of chickadees be able to appropriate a peripheral part of a larger, titmouse territory and nest there successfully.

One might wonder from these observations if population densities of *inornatus* might not be lowered as a result of the influx of chickadees into the Berkeley Hills. In Strawberry Canyon, where conditions are favorable for titmice, presence of the chickadees has not resulted in restriction of occupancy of the area by titmice. Population data for the Plain Titmouse for a 44-acre plot are available for a six-year period, 1947–1952 (Dixon, 1949 and MS). For the first three years, chickadees did not occur on the study tract, adjacent to the university campus, during the breeding season. In later years, special effort was made to determine whether or not the chickadees could invade those parts of the canyon below the 800-foot contour during the nesting season. Breeding season densities on the study tract are listed below:

	P. inornatus	*P. rufescens*
1947	7 pairs	0
1948	7 pairs + 1 male	0
1949	Data incomplete	0
1950	6 pairs	0
1951	7 pairs	0
1952	9 pairs + 1 male	1 pair

In the year of the first chickadee nesting in the lower elevations of Strawberry Canyon, the highest known population density of titmice occurred. In the same year, due in part to a realignment of titmouse territories, three pairs of titmice in addition to the pair of chickadees nesting in the Cliff Swallow nest were found nesting in a section of the University campus which usually supported only two pairs of titmice. However, chickadees are increasing in numbers and are spreading in the area so some further adjustments may occur.

The distribution of Plain Titmouse territories in a given locality tends to be fairly constant from one year to the next because the territories are occupied throughout the year. Moreover, the maximum breeding density of the titmice for a given season usually is established before the chickadees begin seeking nest sites early in March (Dixon, MS). In all cases known to me, those chickadee pairs which nested in localities inhabited by both species selected vacated titmouse territories or sites which appeared suboptimal for titmice. However, spatial separation may be of short duration, as indicated by the following observations. After three months absence, I resumed study of the titmouse territories in Strawberry Canyon in the second week of May, 1951. During that week, chickadees were sought in the canyon but were not found. In the period from May 25 to June 4, three broods were encountered in the canyon bottom. Presumably they had nested in eucalyptus groves on the north side of the canyon above the 1000-foot level and had moved downslope seeking more adequate food sources for their fledged juveniles in the live oaks and riparian alders. At that time the titmice are feeding their own fledglings and are lax in the defense of their territories against intruders of their own species.

These observations were made at a locality where the natural habitats preferred by the two species are not distinctly separated and habitat segregation does not function to keep the two species apart. The year-around occupancy of territory by the Plain Titmouse confers a distinct advantage upon that species in its competition for space with the chickadees. Similarities in voice and mannerisms and the frequency of contacts result in interspecific tensions which, as Simmons (1951:412) pointed out, may serve to reduce competition in localities where species of similar requirements occur in the same habitat. Some of the territories in Strawberry Canyon held by titmice year after year include streamside alders and willows, a type of growth utilized by chickadees elsewhere in their range. The chickadees are excluded from such sites by the larger, permanently territorial titmice and retire to nest in planted groves not frequented by titmice, returning to the more varied native timber as soon as their nestlings are fledged. This pattern of behavior is different from that reported for this species in coastal pine forests by R. A. Norris. He stated (personal communication) that in that association, in which *P. inornatus* does not occur, family groups of chickadees appeared to remain on their territories after the young could fly. These observations suggest modification of the breeding behavior of the chickadees under certain circumstances, the adjustments made permitting them to rear their broods with a minimum of conflict with titmice.

This case is similar in some respects to that of the two species of hummingbirds studied by Pitelka (1951) in a nearby part of the Berkeley Hills. He found that the larger, permanent resident Anna Hummingbird (*Calypte anna*) kept the smaller, migratory Allen Hummingbird (*Selasphorus sasin*) from realizing occupancy of all suitable breeding sites. The smaller species usually utilized sites which were not selected by the larger form and seldom occupied territories suitable to the latter. Pitelka concluded that the breeding population densities of the smaller species would be higher in the absence of the larger competitor, a conclusion which might also be drawn from the present study. However, like the case of the larger of the two hummingbirds, the breed-

ing densities of the titmouse (at least in favorable habitat) do not appear to be depressed. The adjustments made between the two species for the division of the available habitat do not appear to be mutual, but are unilateral as far as I can determine. The smaller form is enabled to occupy the same localities as the larger (where the preferred habitats are not distinct) by nesting in sites which are marginal for titmice and by what appears to be modification of normal breeding behavior patterns which permit it to utilize one type of area for nesting and later move to another for feeding of the fledglings.

Elsewhere in the Berkeley Hills the population balance between these two species may be more nearly equal. Dr. Alden H. Miller suggested to me that this may be the case in the lower part of Wildcat Canyon, Contra Costa County. Parts of that canyon may be cooler, as a result of shade from surrounding hills or from eucalyptus groves, and thus may be more suitable for the chickadees than are some parts of the west slope of the Berkeley Hills. The chickadee has been established in that area for a longer period and its relative numbers there at present may reflect a state of balance yet to be reached in Berkeley. In some portions of Wildcat Canyon, the woodlands are more continuous, a factor which may in some way favor the chickadees in obtaining breeding space. However, the defense of territory by established titmouse pairs at all times of the year gives that species an advantage over the chickadees in selection of breeding sites even in areas where the chickadees are well established.

SUMMARY

Within the past 15 years the Chestnut-backed Chickadee has become established as a breeding bird in the district immediately to the east of San Francisco Bay. The interrelations of this species with its larger congener, the Plain Titmouse, are considered in the light of studies of the latter species made prior to the influx of the chickadees.

The two species differ markedly in plumage pattern and the titmouse is stouter-billed as well as larger.

The preferred habitats of the two forms are not separated sharply in some parts of the Berkeley Hills so that ecological segregation is not effected.

Study of foraging habits suggests only partial overlap in foraging sites in winter. During the period when fledglings were being fed, size of food items taken appeared to differ.

Spatial requirements during the breeding season appear similar, but the smaller form is at a disadvantage because the larger defends its territorial holdings throughout the year. In all cases studied, the breeding territories of the titmouse and chickadee were mutually exclusive. As a result of similarities in behavior and frequent contacts where both species occur in the same habitat, interspecific territorial behavior is elicited, resulting in spatial segregation during the nesting season.

Population data for the titmouse on a 44-acre tract, where conditions are favorable to that species, reveal no restriction in ecologic range or spatial holdings during the early period of establishments of the chickadee in the area.

In the face of antagonism of the larger form, the adjustments permitting the coöccupancy of the area at this stage appear to be made entirely by the smaller species. These include selection of vacated or suboptimal nesting territories and possible modification of territorial behavior patterns.

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NESTING OF MEARNS QUAIL IN SOUTHEASTERN ARIZONA

By O. C. WALLMO

Accounts of nests of the Mearns or Montezuma Quail (*Cyrtonyx montezumae mearnsi*) are so few that the discovery of several nests and the observations related to them seem to be worthy of record. These observations were made in the Huachuca Mountains, Cochise County, Arizona, in 1950. This mountain range rises from desert grassland pediments of about 5000 feet elevation to a maximum height of 9445 feet. The vegetative cover is largely oak woodland and chaparral, with lesser areas of pine-oak woodland and pine-fir forest. The data were collected incidental to activities under Pittman-Robertson project 46–R, Arizona Game and Fish Commission.

Mearns Quail are considered to be quite rare where they occur in Texas, New Mexico, and Arizona, but they were found to be fairly common in the Huachuca Mountains in the period from 1948 to 1951. In 1949 and 1950 there seemed to be a decided population increase, judging from intensive personal observations and the universal testimony of local residents. Most residents said that "fool quail" were more numerous than they had seen them for many years. This apparent population increase applied at least to all of the area between the San Pedro and Santa Cruz rivers, including Mearns Quail range in the Huachuca and Patagonia mountains and the Canelo Hills (Cochise and Santa Cruz counties).

In 1949 paired birds were first observed on April 15 in the Mule Mountains, 20 miles east of the Huachucas. That year, when little work was done in Mearns Quail range during the breeding season, 3 broods were seen as follows: August 4, 1 adult, 5 young; August 5, 1 adult, 5 young; September 7, pair with 7 young.

In 1950, paired birds were first observed on April 11. Between April 11 and September 18, 32 pairs without young were observed, none of which observations could reasonably be called duplications. The first juveniles that year were seen on July 16. The following broods were seen that season: July 16, pair with 2 young (2 inches long); August 3, pair with 10 young ("larger than sparrows"); August 12, pair with 2 half-grown young; September 13, pair with 7 young; September 26, pair with 9 young; September 28, pair with 11 young of 2 age classes; October 6, 2 pairs, each with 7 young; October 9, pair with 4 young; October 30, 11 young; October 31, pair with 1 young. After that date young birds were not distinguishable in the field. These brood counts may not in all instances represent the entire brood.

In 1951, paired birds were not observed until May 25. Work in Mearns Quail range was discontinued in June and no more observations were obtained.

In a cursory review of the literature, several dates were found which pertained to the period of reproduction, all being observations in Arizona. They were: June 14—young birds seen (Sutton and Phillips, 1942); June 18—eggs, August 10—young a week old (Bent, 1932); August 17—newly hatched chicks, August 22—fresh eggs, September 5—late nest (Willard, 1913); October—young two-thirds grown (Scott, 1886).

Our observations of nests and more abundant observations of young broods, in addition to the published dates, show that nesting in southern Arizona is principally in the summer rainy season which usually occurs between late June and late September. This late season of breeding has also been reported by Campbell (1934), Brandt (1951), Miller (Robertson, 1932) and Swarth (1909). The dampness in this season, according to O. C. Poling (Bent, *op. cit.*), is often responsible for staining the normally white eggs. We found such stained eggs in an active nest discovered on July 12, 1950. At that time light to heavy rains fell daily and the grass in the nest was damp.

Nests found by Poling, Todd, Owen and Willard were described by Bent (*op. cit.*). Apparently Willard had seen a large number of nests but we found reference to only three (from the Huachuca Mountains) which he reported. Descriptions of seven nests found in the summer of 1950 are given below. One of these nests (number 2) was found by the author. The other six were found and shown to me by residents of the area. Nest number 7 was in the Canelo Hills just west of the north end of the Huachuca Mountains. The others were in the Huachuca Mountains proper.

Fig. 1. Nest no. 3, a depression in maple and sycamore leaves.

Fig. 2. Nest no. 6, a chamber in curly mesquite and hairy grama; egg fragment on top of nest.

Nest 1.—July 8, found by Mr. Tom St. John; female at nest; eleven eggs. July 23, female walked away with 11 chicks; no shell fragments left in nest (some found 2 feet from nest); during incubation the hen was gone most of the morning; on leaving she would pull leaves over the entrance; no male was seen at the nest during this 15-day period (information from Mr. St. John). The nest was situated in the bottom of Ramsay Canyon, 5700 feet elevation, under a dense canopy of Rocky Mountain maple (*Acer glabrum*) and Arizona oak (*Quercus arizonica*) in deep shade. It was fifty feet from the base of a water storage tank, 100 feet from a running stream, and 200 yards from a residence. The site was cool and moist. The nest was placed against the base of a small Arizona oak and consisted of a chamber sparsely roofed with bedstraw (*Galium* sp.) and bullgrass (*Muhlenbergia emersleyi*). The floor was lined with dry leaves of Arizona oak. Interiorly it was about 5 inches wide and 4 inches high.

Nest 2.—July 12, female flushed from nest; ten eggs. July 13, female present; eleven eggs. The nest was deserted some time between July 13 and 28. The site was in the bottom of McClure Canyon, 6300 feet, in a small meadow of pinyon ricegrass (*Piptochaetium fimbriatum*), under a woodland of Rocky Mountain maple and silverleaf oak (*Quercus hypoleucoides*). A stream was about 100 yards away and the area was cool and moist. The nest was a roofed chamber of pinyon ricegrass, the interior being about 6 inches wide and 4 inches high; it was lined with dry grass, some Emory oak (*Quercus emoryi*) leaves, and very little down. The eggs averaged 1.19 × 0.98 inches and were clear white but stained.

Nest 3.—July (no date), found by Mr. Clint Post. Reportedly, 8 or 9 chicks hatched about July 20. The site was in the bottom of Ramsay Canyon, 5800 feet, under a dense woodland of maple and sycamore (*Platanus wrightii*). There was a sparse ground cover of grape (*Vitis arizonica*), bromegrass (*Bromus* sp.) and *Equisetum*. It was situated about 250 yards from nest 1, 4 feet from the edge of a travelled road, and 20 feet from a stream—a cool, moist site. The nest was in a barely perceptible hollow in dead maple and sycamore leaves, with no canopy and was among the trunks of a dense thicket of small maples (fig. 1).

Nest 4.—July 30, found by Mrs. Ila Healy; female flushed from nest; thirteen eggs "well incubated." August 13, fragments of 2 eggs lay 4 feet in front of the nest; fragments of 11 eggs in the nest; a male was calling 200 yards below the nest and several other quail were heard "talking." The site was hot and arid on a limestone ridge above Blacktail Canyon, 6000 feet. The nest was on an east-facing slope with chaparral cover (fig. 3) of mountain mahogany (*Cercocarpus breviflorus*), sotol (*Dasylirion wheeleri*) and agave (*Agave palmeri*), and a dense lower-story of sideoats grama (*Bouteloua curtipendula*), plains lovegrass (*Eragrostis intermedia*) and *Brickellia* sp. There was a temporary water seep 200 yards below. The nest was hollowed out of a dead clump of plains lovegrass, almost under a limestone boulder. It was shaded by tall clumps of sideoats grama and plains

Fig. 3. Site of nest no. 4; slope grown to mountain mahogany-sotol chaparral.

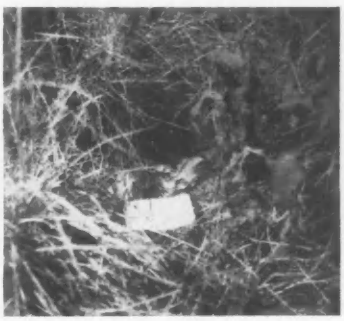

Fig. 4. Nest no. 4, chambered in plains lovegrass.

lovegrass. The interior was 6 inches wide and 4 inches high, and the floor was lined with dry grass fragments and down (fig. 4).

Nest 5.—August (no date), found by Messrs. Little, Worthen and Yorger (date not recalled) while cutting weeds; female present; deserted nest with one egg. The site was an open woodland of Arizona oak and juniper (*Juniperus pachyphloea*), 5900 feet, about 100 yards from buildings of Jack Wakefield mining camp. No water was present except that around the buildings. The area was hot and arid. The nest was in a clump of bulb panicgrass (*Panicum bulbosum*), well concealed by sprouts of Arizona oak and was chambered about as in nest 4.

Nest 6.—September (no date), found by Mr. Carl Yorger (date not recalled); reported "15 or 20 eggs, all hatched," prior to September 18. The site was on a hot and arid grassland mesa (Campini Mesa) at 5500 feet. There was a draw with Arizona and Emory oak about 100 feet away. The principal grasses were plains lovegrass, blue and hairy grama (*Bouteloua gracilis, B. hirsuta*), and curly mesquite (*Hilaria belangeri*). The nearest water was one-half mile away. The nest was hollowed out of a dense, mixed clump of curly mesquite and hairy grama, with constructed elements of stems of those grasses. The floor was lined with grass.

Nest 7.—September 20, accidentally stepped on by Mr. Holt (Holt Ranch, Canelo Hills); nine eggs; hen flushed and deserted; the eggs, examined on September 29, were about ready to hatch when disturbed. The site was hot and arid in open grassland of curly mesquite and blue grama at 5000 feet. It was several hundred yards from oak woodland, 200 yards from ranch buildings, and 6 feet from an irrigation ditch under construction. Water was abundant around the ranch buildings. The nest consisted of a chamber under a clump of curly mesquite. The roof contained many dead stems of showy goldeneye (*Viguiera multiflora*), and the floor was of grass stems. The interior of the chamber was 6 inches wide and slightly less in height.

Although males were never seen at the nests, the several families of Mearns Quail observed in the summer of 1950 were all accompanied by the male. Willard reported males on the eggs "in about half the nests examined" (Bent, *op. cit.*).

The canopied construction of nests may afford significant protection during the

frequent rains of the breeding season. In the nests where the canopy was flimsy or absent there was a dense over-story of broad-leaved trees which probably served the necessary protective function. However, shade may be as important as protection from rain for successful incubation.

If one may judge from these limited data, there is great latitude in the nesting requirements of Mearns Quail. In the Huachuca Mountains they were found to inhabit all the vegetation types but they were seen least frequently in the desert grassland below 5000 feet. Although the highest nest found was at 6000 feet, the presence of young broods indicated that nesting occurred at much higher elevations.

When the population was high, in 1950, there was obviously an increased use of the grassland areas, and this probably represented an expansion of range at that population level. It was mentioned by Mearns (1890) that the range of this quail overlaps that of "Gambel's Partridge" in certain parts of Arizona. On the north pediment of the Huachuca Mountains we found them in range occupied both by Gambel Quail and Scaled Quail. This was on plains broken by draws containing oaks, mesquites, and other shrubs. The grassland, consisting largely of plains lovegrass, curly mesquite, and several perennial gramas, had been protected and was much more dense than it is commonly found to be today in that region. The lowest record of occurrence obtained was at 4500 feet, near the Babocomari River, north of Fort Huachuca on the edge of relatively barren desert shrub vegetation.

In the period from July 1, 1949, to June 30, 1950, on the Fort Huachuca Wildlife Area, we observed at least 197 separate individuals in an area of about 25,000 acres. Surveying a small watershed more intensively, we found 45 individuals in the winter on approximately 1100 acres (Wallmo, 1951). If this density prevailed generally, as it seemed to, the 25,000 acres would have contained some 1000 birds. All of the Huachuca Mountains, about 20 miles in length, would, at that density, have had a population of perhaps 2500 birds. While it should be emphasized that such expansion of the data may not be justified, it serves to give an indication of the approximate population level.

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Division of Wildlife Restoration, Texas Game and Fish Commission, Austin, Texas, December 7, 1953.

A REVISION OF THE NEOTROPICAL FINCH ATLAPETES BRUNNEI-NUCHA

By KENNETH C. PARKES

The Chestnut-capped Atlapetes, *Atlapetes brunnei-nucha* (Lafresnaye), is a medium-sized finch with a range extending from central México to southern Perú. It and its closest allies are sometimes segregated as a separate genus, "*Buarremon,*" but I agree with Hellmayr (1938:385) that it is not practical to subdivide the genus *Atlapetes*. The species *brunnei-nucha* is primarily an inhabitant of the Subtropical Zone, with an altitudinal distribution ranging, as shown by specimens I have examined, from 1200 feet on the Río Casanga, Ecuador, to 10,400 feet on Volcán Tajumulco, Guatemala. The bird lives in dense undergrowth and is usually collected along the borders of trails or clearings, "either because it or the collector selects such situations" (Chapman, 1923: 246). Chapman, who observed the species in Colombia, Ecuador and Veracruz, considered it "by no means shy" (*loc. cit.*), whereas Lowery and Dalquest (1951:642) found it "a very shy and retiring species" in Veracruz.

In his monograph of the "genus *Buarremon,*" Chapman (1923) referred several times to the fact that *brunnei-nucha,* in spite of its extended geographical range, showed remarkably little variation; what little variation he did observe he considered insufficient to warrant nomenclatorial recognition. This notion of the uniformity of *A. b. brunnei-nucha* from México to Perú (another subspecies being recognized from eastern Venezuela) was perpetuated by a number of later writers including Griscom (1932:370) and Hellmayr (1938:414). Griscom (1934:421) was aware of the large size of birds from southwestern México and Guatemala, but he considered that this size variation was best ignored. The first definite indication that the supposed uniformity of this finch might be untrue came from de Schauensee (1952:1214), who correctly pointed out a consistent color difference between Honduran and Colombian specimens. After examination of about 400 skins, I have found that the range customarily assigned to *Atlapetes brunnei-nucha brunnei-nucha* is actually occupied by no less than six subspecies.

All the subspecies of *Atlapetes brunnei-nucha* have greenish upper parts and white under parts bordered by a varying amount of gray. All have a brown crown and a black forehead, the latter bearing three longitudinal white marks. The black of the forehead is continued as a mask between the brown of the crown and the white of the throat. The principal color characters which vary geographically within the species include the presence or absence of a black pectoral band, presence or absence of a yellow border between the black mask and the brown of the crown, relative proportion of gray and white on the breast and abdomen, extent of the black forehead area, and presence or absence of a yellow spot on the nape. Certain color variations that appear in individuals throughout the range of the species occur with higher percentages of frequency in some populations than in others. Such geographically correlated variations include the presence of a marked brownish wash on the upper tail coverts and edgings of the rectrices and the presence of gray tips to some of the ventral white feathers that give a "scalloped" appearance. Color variations which appear to be entirely individual (or seasonal) in nature include the shade of green of the upper parts, the shade of brown of the crown, the width of the pectoral band when present, the amount of greenish wash on the gray flank feathers, and the presence of occasional yellow feathers in the white frontal spots.

In juvenal plumage, *Atlapetes brunnei-nucha* is similar in dorsal pattern to the adult but is much duller in color. The black frontal area and mask of the adult are dull gray

in the juvenile, and the white frontal markings are absent. The white of the throat is heavily spotted with dull olive. The breast and abdomen are heavily streaked with dull olive on a white or dull yellow background. The pectoral band is represented by a poorly defined unstreaked zone of dull olive between the throat and the streaked portion of the under parts; no juvenal specimen of any race lacking the pectoral band was available to me. Material of this species in full juvenal plumage was insufficient to attempt any study of geographic variation in color. In young birds, all or most of the lower mandible is dull yellowish horn in color; traces of this yellow remain well after the postjuvenal molt has been completed. All birds showing any signs of this yellow on the mandible have been excluded from the measurements.

There is a striking color resemblance between those races of *Atlapetes brunnei-nucha* which possess the pectoral band and *Pipilo ocai,* a Mexican towhee. This resemblance led Chapman (1923:256-258) to conjecture that *Atlapetes brunnei-nucha* was derived from *Pipilo ocai* (= *P. torquatus* of Chapman's usage). Wetmore (1943:336, 337) and Sibley (1950:145) preferred to attribute this color similarity to parallelism. To my mind, none of the differences cited by Wetmore as reasons for believing that the two species are not actually closely related is as significant as a difference mentioned by Chapman himself. This is the fact that despite the color similarity of the adults, the juvenal plumages of the two species are quite unlike. Chapman admitted that he was unable to explain this difference, which I believe to be more fundamental than the difference in size and proportion listed by Wetmore. Before we can draw any definite conclusions as to the derivation and relationships of the species in question, however, we still have much to learn about the interrelationships of certain currently recognized genera of Fringillidae such as *Atlapetes, Pipilo, Chlorura, Torreornis* and *Melozone.*

The species *Atlapetes brunnei-nucha* may be divided readily into two groups of subspecies—those with and those without the black pectoral band. Chapman (1923) discussed at length the significance of this character in this and related species of "*Buarremon.*" It is my belief that the unbanded forms represent a mutation from banded stock which became fixed in three isolated populations. This was essentially Chapman's idea, and, considering the stage of our knowledge of population genetics in 1923, Chapman was far ahead of his time. It should be noted, however, that an alternate hypothesis exists, with perhaps an equal possibility of being the correct interpretation. Dr. Wetmore writes (letter of October 4, 1953) "I look on such matters as *Atlapetes apertus* [here considered a race of *brunnei-nucha,* as indicated beyond] as an ancient genetic inheritance that has carried an original pattern over as an underlying character, swamped out in the main in a newer population (with dark breast band) but cropping out when there is an inhibition or failure in the newer element for some reason . . . . In *Atlapetes apertus* we have a condition that is fixed in an isolated population." We thus agree on the mechanism of fixation in isolation; the moot question is whether the banded or unbanded pattern represents the ancestral condition.

Of the three races which lack the pectoral band, only one, *allinornatus,* was actually described as a subspecies of *brunnei-nucha* (Phelps and Phelps, 1949). Sclater and Salvin (1879) described *inornatus* at a time when the subspecies concept had not obtained a foothold in England. Chapman (1923) continued to give *inornatus* specific rank, but pointed out in detail that individual variation in the extent of the pectoral band almost completely bridges the gap between *inornatus* and *brunnei-nucha,* a fact which influenced Hellmayr (1938:415) to treat the two as conspecific. Wetmore (1942:108) described *apertus* as a full species, and later (1943:336, 337) explained his views in greater detail. The only supposedly unique character which he ascribed to *apertus* was the lack of the yellowish line bordering the brown crown. However, as will be shown

beyond, this absence is also characteristic of the Honduran race, a form possessing the pectoral band. Thus *apertus* has no characters uniquely its own, but merely exhibits a different combination of the characters found in other races. The three plain-breasted forms, then, are here considered to be subspecies of *Atlapetes brunnei-nucha*. It is of interest to note that all three of these races are exceptionally isolated, and that the plain-breasted mutation has apparently arisen and become fixed upon three independent occasions. It happens that there are certain characters by which we can separate these three populations in terms of their physical appearance. It is conceivable, however, that exploration of another isolated mountain range somewhere in South or Central America might reveal a plain-breasted form of *Atlapetes brunnei-nucha* indistinguishable from one of the known races, yet obviously independently derived by a parallel mutation. This would lead to certain unavoidable difficulties in reconciling nomenclature to relationships, a situation which has arisen in other groups of animals. But this is, at the moment, a theoretical bridge which we will try to cross when and if it becomes real.

All measurements given in this paper are in millimeters. The wing measurement is that of the flattened wing. The tail measurement was made in the usual way, with one point of the dividers at the base of a central rectrix and the other at the tip of the longest rectrix. The bill measurement was taken by placing one point of the dividers at the anterior margin of the nostril opening and the other at the tip of the upper mandible. It is felt that this measurement can be taken more accurately and consistently than any of the usual culmen measurements. All measurements are taken to the nearest half millimeter, and means are rounded off to one decimal place.

This study is based on the series of *Atlapetes brunnei-nucha* in the collections of Carnegie Museum and the American Museum of Natural History, supplemented by 175 specimens borrowed from other collections. I wish to thank the following persons for their courtesy in lending specimens from their respective institutions: Emmet R. Blake (Chicago Natural History Museum), William C. Dilger (Cornell University), Herbert Friedmann (United States National Museum), J. C. Greenway, Jr. (Museum of Comparative Zoölogy), George H. Lowery, Jr. (Louisiana State University), Frank A. Pitelka (Museum of Vertebrate Zoology), Robert W. Storer (University of Michigan), and Harrison B. Tordoff (University of Kansas). Specimens were also borrowed from the personal collections of George M. Sutton and William H. Phelps. John T. Zimmer kindly arranged to send certain critical specimens to Pittsburgh, after I had seen them in the American Museum of Natural History, and was especially helpful in locating collecting stations in South and Central America for me

Atlapetes brunnei-nucha brunnei-nucha (Lafresnaye)

Embernagra brunnei-nucha Lafresnaye, Rev. Zool., 2:1839:97. México.

Hellmayr (1938:412) correctly poïnted out that the "Bogotá" specimen listed by Bangs (1930. 393) cannot possibly be the type of Lafresnaye's *Embernagra brunnei-nucha,* since the original description states "Hab. Mexico" and was explicitly based on a Mexican specimen in the collection of Charles Brelay at Bordeaux. In the present revision four races of this species are recognized as occurring within the borders of México, so it became necessary to determine, if possible, the identity of the type specimen. I have been informed by Dr. J. Berlioz (letter of April 16, 1953) that this type specimen and, indeed, the entire Brelay collection have disappeared. A restriction of the type locality of *Embernagra brunnei-nucha* thus becomes necessary. I designate Jalapa, Veracruz, a source of many early Mexican collections, and a locality well represented by specimens in modern museums.

Characters.—Pectoral band present. Under parts extensively gray, with white often confined to a narrow midventral area. Most similar to the Costa Rican subspecies, from which it is separated geographically by two others, and from which it differs chiefly in lesser extent of the black forehead area (see description of the Costa Rican race, beyond). Similar in color to the subspecies of Chiapas

and Guatemala, but smaller, especially the tail. Occasional individuals resemble the form which inhabits Oaxaca and Guerrero in possessing a yellow nape spot, but this is a rare variant in *A. b. brunneinucha*. I have examined the two Presidio specimens described by Bangs and Peters (1927:485), which these authors characterized as having unusually dark crowns. One can be matched by several other specimens, but the other is a dark extreme and must, of course, be regarded as an individual variant. For measurements, see table 1.

Distribution.—Subtropical zone of eastern México in the Sierra Madre Oriental from southeastern San Luis Potosí to southwestern Veracruz.

Specimens examined.—MÉXICO. GUERRERO: Cuapongo, mountains above Chilpancingo, Omil-San Antonio, Tamazunchale, Xilitla. VERACRUZ: Jalacingo, Jalapa, Jico, Ojochico, Orizaba, Presidio, Teocelo, Tezuitlan.

Atlapetes brunnei-nucha suttoni, new subspecies

Type.—Adult male, no. 115581, Museum of Vertebrate Zoology, University of California; La Cumbre (9000 feet), 5 miles northeast of Cerro San Felipe, Oaxaca, México; April 1, 1948; collected by Charles G. Sibley, original number 3140; weight 36.3 grams; testes 4 mm.

Characters.—Similar to *A. b. brunnei-nucha,* but the brown of the crown, instead of being abruptly delimited from the green of the back, is continued onto the back as two irregular lines which enclose a yellow spot; the median longitudinal white line of the forehead does not terminate within the black portion of the frontal area as in *brunnei-nucha,* but at or beyond the junction of the black and brown portions of the crown; in some specimens there is a suggestion of a yellowish coronal stripe connecting this median white frontal line with the yellow nape spot; yellow lines at lateral borders of crown more prominent and sometimes nearly confluent with the lateral white markings of the frontal area; white of under parts more extensive; average size larger, especially tail length.

Distribution.—The "Sierra Madre del Sur Biotic Province" (Goldman and Moore, 1945) in the states of Guerrero and Oaxaca, México.

Specimens examined.—MÉXICO. GUERRERO: Cuaponga, mountains above Chilpancingo, Omilteme. OAXACA: Cerro San Felipe, La Cumbre.

Remarks.—Although an indication of the yellow nuchal spot characteristic of this subspecies may appear as a rare variant in other races, especially those of México, only in *suttoni* is it consistent. Among the specimens examined the extreme development of this yellow spot is illustrated by U.S.N.M. 143589, collected by Nelson and Goldman near Chilpancingo, Guerrero. The yellow nuchal spot is projected into a line extending half the length of the crown, while the median white frontal stripe is continued onto the brown of the crown by three or four yellow feathers. This is obviously an approach to the striped crown typical of several related species of *Atlapetes.*

From the northernmost part of its range in México to Guatemala, *Atlapetes brunnei-nucha* exhibits a cline of increasing size, manifested particularly in tail length. Oaxaca specimens of *suttoni* thus average larger than those from Guerrero, but it does not appear practical to separate them on this basis.

It is a pleasure to name this distinctive Mexican subspecies for Dr. George M. Sutton.

Atlapetes brunnei-nucha apertus Wetmore

Atlapetes apertus Wetmore, Proc. Biol. Soc. Wash., 55, 1942:108. Cerro de Tuxtla (about 2500 feet), Sierra de Tuxtla, Veracruz, México.

Characters.—Pectoral band absent. Differs from the South American plain-breasted races *inornatus* and *allinornatus* in that the yellow lines at the lateral borders of the crown are absent or but faintly indicated, resembling in this respect the Honduran race, in which the pectoral band is present. The two specimens of *apertus* and one of *allinornatus* I have examined show no traces of the pectoral band; on the other hand, *inornatus* of Ecuador often exhibits an indication of the band (see Chapman, 1923: plate 14, fig. *d*). The under parts of *apertus* resemble those of the geographically neighboring *brunnei-nucha* in being mostly gray, with the white restricted to a narrow midventral zone. The other plain-breasted subspecies are more extensively white below, resembling in this respect the widely distributed South American banded race *frontalis.*

Measurements.—One male—wing, 86; tail, 78.5; bill, 12; 1 female—wing, 80.5; tail, 72.5; bill, 11.5. Wetmore's original measurements were taken by methods differing from mine. His figures, taken

from the original description of *apertus*, are here appended as an indication of the range of variation in this subspecies, since only one specimen of each sex was available to me. Two males—wing (chord), 81, 81.8; tail, 72.8, 75; culmen from base, 16.8, 17.4; 3 females—wing, 76.8–78.2 (77.7); tail, 70–72.9 (71.2); culmen from base, 16.7–16.9 (16.8).

Distribution.—Volcán San Martín and Cerro de Tuxtla, Sierra de Tuxtla, southern Veracruz, México.

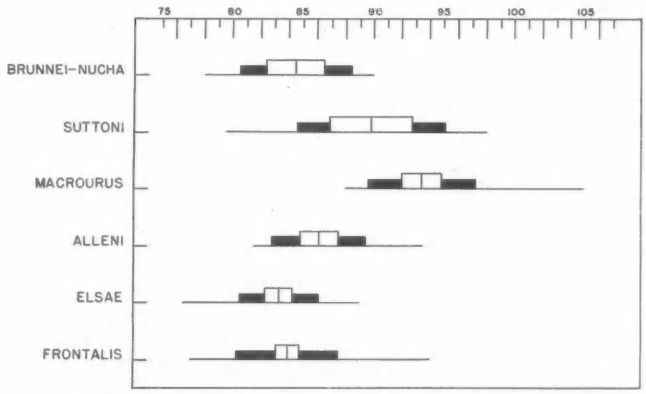

Fig. 1. Tail length in millimeters of adult males of *Atlapetes brunnei-nucha*. The base line represents the observed range; vertical line, mean; white rectangle, two standard errors on either side of mean; black rectangle, one standard deviation on either side of mean. When the rectangles for standard deviation neither overlap nor are separated, about 84 per cent of the specimens of one group is separable from about 84 per cent of the other. The separation of these rectangles in *brunnei-nucha* and *macrourus* indicates that an even higher number is separable.

Specimens examined.—MÉXICO. VERACRUZ: Volcán San Martín.

Remarks.—My reasons for considering *apertus* as a subspecies of *brunnei-nucha* rather than as a full species as originally described are given in the introductory paragraphs of this paper.

Atlapetes brunnei-nucha macrourus, new subspecies

Type.—Adult male, no. 94150, Chicago Natural History Museum; Volcán Tajumulco (9200 feet), San Marcos, Guatemala; February 16, 1934; collected by Emmet R. Blake, original number 1193.

Characters.—Similar to *A. b. brunnei-nucha*, but tail decidedly longer; other measurements averaging greater; white of under parts more extensive, as in *suttoni*.

Distribution.—Mountains of Chiapas, México, and the adjacent Sierra Madre of southwestern Guatemala; the "Chiapas Highlands Biotic Province" of Goldman and Moore (1945).

Specimens examined.—MÉXICO. CHIAPAS: El Phenix, Letrero, Monte Ovando, Pico de Lora, Pinabete, San Cristóbal, Triunfo, Tumbala, Volcán de Tacaná. GUATEMALA. Chimaltenango, Sierra Santa Elena, Tecpam, Volcán San Lucas, Volcán Tajumulco.

Remarks.—This subspecies represents the large extreme of a north-south cline of increasing tail length. It is isolated from the closely related *brunnei-nucha* by the lowlands of the Isthmus of Tehuantepec. This isolation, together with the minor, but readily apparent, difference in the color of the under parts and the pronouncedly greater tail length, justifies, in my opinion, formal separation of the Chiapas-Guatemala population as a subspecies. I have seen no specimens from eastern Guatemala, where *macrourus* presumably intergrades with the distinctive subspecies of Honduras and El Salvador, described herein.

Atlapetes brunnei-nucha alleni, new subspecies

Type.—Adult male (breeding), no. 135261, Carnegie Museum; San Juancito, Honduras (cloud forest, 6500 feet); August 4, 1951; collected by Arthur C. Twomey and Roland W. Hawkins, original number 15399.

Characters.—Differs from all other races of *Atlapetes brunnei-nucha* except *apertus* in lacking the yellow lines at the lateral margins of the brown coronal area. Differs from *apertus* in possessing a pectoral band. Under parts average somewhat whiter than in *suttoni* and *macrourus*, decidedly whiter than in *brunnei-nucha* and *apertus*.

Table 1

Measurements in Millimeters of Adult Specimens of *Atlapetes brunnei-nucha*

Sex	No. of specimens	Wing		Tail		Bill	
		Mean with standard error	Standard deviation	Mean with standard error	Standard deviation	Mean with standard error	Standard deviation
brunnei-nucha							
♂	17	84.9±0.72	2.9	84.4±1.04	3.9	11.6±.11	0.46
♀	18	80.8±0.66	2.7	81.3±0.95	3.9	11.4±.09	0.40
suttoni							
♂	15	85.2±0.81	3.0	89.8±1.44	5.2	11.5±.11	0.41
♀	10	81.5±0.88	2.8	84.7±1.36	4.3	11.1±.12	0.37
macrourus							
♂	33	88.5±0.45	2.6	93.4±0.69	3.8	11.8±.09	0.54
♀	17	83.0±0.66	2.7	85.1±0.85	3.3	11.4±.18	0.72
alleni							
♂	32	86.6±0.44	2.4	86.1±0.67	3.3	11.3±.08	0.45
♀	15	83.3±0.85	3.2	83.1±1.12	3.7	11.2±.14	0.52
elsae							
♂	36	84.6±0.45	2.5	83.3±0.49	2.8	11.5±.08	0.47
♀	12	80.9±0.73	2.4	79.7±1.27	4.2	11.3±.19	0.62
frontalis							
♂	79	85.0±0.31	2.7	83.9±0.42	3.6	12.2±.06	0.54
♀	53	80.9±0.36	2.5	80.0±0.55	3.5	11.9±.07	0.52
"*xanthogenys*"							
♂	12	83.9±1.11	3.5	86.5±0.66	2.1	12.3±.30	1.00
♀	7	78.0	....	79.2	....	12.0	.....

Distribution.—Mountains of northern El Salvador, Honduras, and western Nicaragua.

Specimens examined.—EL SALVADOR. Los Esesmiles, Mt. Cacaguatique. HONDURAS. Cantoral, La Cueva, La Libertad, Muye, Portillo Grande, San Juancito, San Pedro (Copan), Soluteca. NICARAGUA. Matagalpa, Muy Muy, Peña Blanca, Río Coco, Río Tuma, San Rafael del Norte.

Remarks.—The characteristics of this form were first noted by de Schauensee (1952:1214), who perceived the difference between Honduran and South American specimens. Lack of material prevented his coming to any definite conclusions.

Specimens from central and eastern Nicaragua are quite variable, apparently representing intergrades toward the Costa Rican form, although separated from the latter by fairly extensive lowland areas unsuited to this species. Western Nicaraguan specimens are almost as uniform as those from Honduras and El Salvador, although an occasional specimen shows a fairly well marked yellow edge to the brown of the crown. Even in Honduran birds, the edges of the crown are sometimes perceptibly lighter in color than the center, but the well demarcated yellow line of the other races is absent.

This subspecies is named in honor of Dr. Arthur A. Allen of Cornell University.

Atlapetes brunnei-nucha elsae, new subspecies

Type.—Adult male, no. 11230, Carnegie Museum; Volcán de Irazú [between 8000 and 10,000 feet], Costa Rica; April 16, 1902; collected by M. A. Carriker, Jr., original number 381.

Characters.—Most nearly resembles the geographically distant *A. b. brunnei-nucha,* which it closely matches in size. The chief difference lies in the proportion of black and brown on the crown. In *brunnei-nucha* the line of demarcation between black and brown lies anterior to the center of the eye, while in *elsae* this line is posterior to the center of the eye. When viewed from above, the black area in *brunnei-nucha* appears to occupy no more than the anterior quarter of the crown, while in *elsae* one-third or more of the crown is black. In addition, the white area of the under parts is somewhat more extensive in *elsae* than in *brunnei-nucha,* but far less than in *frontalis,* the subspecies found to the east of *elsae.*

Distribution.—Mountains of Costa Rica and western Panamá.

Specimens examined.—*Atlapetes brunnei-nucha alleni-elsae* intergrades: NICARAGUA. Ocotal, Volcán Mombacho. *Atlapetes brunnei-nucha elsae:* COSTA RICA. Agua Caliente, Azahar de Cartago, Bonilla, El Sauce, Estrella de Cartago, Grecia, La Hondura, Moravia, Navarro, Ojuras de Terraba, San Marcos, Santa Cruz de Turrialba, Villa Quesada, Volcán de Irazú, Volcán Turrialba. PANAMÁ. Boquete, Cerro Campana, Mt. Chiriquí.

Remarks.—It is a pleasure to dedicate this subspecies to Dr. Elsa Guerdrum Allen.

Atlapetes brunnei-nucha frontalis (Tschudi)

Arremon frontalis Tschudi, Arch. Naturg., 10, (1), 1844:289. Perú.

Buarremon xanthogenys Cabanis, Mus. Hein., 1, 1851:141. Caracas, Venezuela.

Characters.—Similar in size to *bruunei-nucha,* but bill averaging longer. Similar also in color to *brunnei-nucha,* but white of under parts much more extensive. Yellow border of crown deeper in color, near Yellow Ocher (Ridgway, 1912) rather than Primuline Yellow as in *brunnei-nucha.*

Distribution.—Mountains of eastern Panamá, Colombia, Ecuador, Perú and western and northern Venezuela, except those portions of Ecuador and Venezuela occupied by *inornatus* and *allinornatus,* respectively.

Specimens examined.—PANAMÁ. Mt. Pirri, Mt. Tacarcuna. COLOMBIA. Aguadita, Andalucia, Bitaco Valley, Buena Vista, Cauca, Cerro Munchique, El Eden, El Roble, Fusagasugá, Gallera, Heights of Caldas, La Candela, La Florida, La Sierra, Las Lomitas, Las Ventanas, Miraflores, Palmira, Peña Blanca, Primavera, Ramirez, Ricaurte, Río Negro, Salento, San Antonio, Santa Elena. ECUADOR. Baeza, Corazon, El Chiral, Macas region, Mindo, Río Cosanga, Río Sardinies, Río Oyacachi, Salvias, San José de Sumaco, Santa Rosa, Sumaco Abajo, Zamora, Zaruma. PERU. Idma, Matchu Picchu, Oconeque. VENEZUELA. Cerro del Avila, Coloia Tovar, Culata, Cumbre de Valencia, El Escorial, El Limon, Galipan, Guamito, Guarico, La Cuchilla, Pico Naiguata.

Remarks.—Friedmann and Deignan (1942:53) give the type locality of *Arremon frontalis* Tschudi as "Peru = eastern wooded region between 8° and 9° lat. south and Jaen de Bracamoras, Peru." This restriction was based on Tschudi's discussion of the species in his "Untersuchungen über die Fauna Peruana," 1844–46. In this work, "Jaen de Bracamoras" (probably an error for Jaén, Dept. Cajamarca) was merely cited as an additional locality from which the species was known, not as a source of Tschudi's specimens. Dr. John T. Zimmer has informed me (letter of October 8, 1953) that he believes "between 8° and 9° lat." to have been a *lapsus calami* on the part of Tschudi, since there is no evidence that Tschudi ever got that far north in Perú. Dr. Zimmer believes that Tschudi's "wooded region of the interior" was the area between 10° and 12°, and on that basis I hereby propose to restrict the type locality of *Arremon frontalis* to the vicinity of the Río Vitoc and Río Tulumayo, an area where Tschudi spent much time.

Within a range as extensive as that ascribed above to *frontalis,* a certain amount of geographic variation is to be expected. Such variation exists, as will be shown later, but it is nowhere sufficiently great, in my opinion, to warrant nomenclatorial recognition. In their Venezuelan check-list, Phelps and Phelps (1950) employed the name *Buarremon xanthogenys* Cabanis for the somewhat isolated population of the coastal ranges of Venezuela. Hellmayr (1938:414) also accepted this race with provision that "this form is perhaps not worthy of recognition." The supposed characteristics of *xanthogenys,* according to Hellmayr, are "longer, slenderer bill and whiter underparts . . . ." Hellmayr correctly pointed out that, although these northern Venezuela birds are quite constant in

the extreme whiteness of the under parts, they can be matched by specimens from other parts of the range of *frontalis* in so many instances that it does not appear feasible to separate "*xanthogenys*" on the basis of color. As for the supposed size difference, some specimens do exhibit particularly slender bills, but most cannot be distinguished from *frontalis* from Colombia, Ecuador and Perú. The size and shape of the bill is especially variable in this species, and the only generalization which can safely be made is that the bills of South American specimens average longer than those of México and Central America. See table 1 for measurements of specimens from the range of "*xanthogenys*."

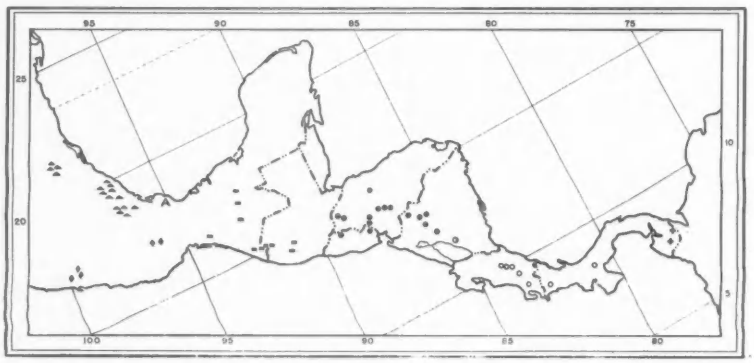

Fig. 2. Distribution of Central American races of *Atlapetes brunnei-nucha*. Each symbol represents a locality from which specimens have been examined. Triangles = *brunnei-nucha*; diamonds = *suttoni*; A = *apertus*; rectangles = *macrourus*; solid circles = *alleni*; half-solid circle = *alleni-elsae* intergrade; open circles = *elsae*; crosses = *frontalis*.

Certain other trends are visible within the range of *frontalis* as here understood. Specimens from eastern Panamá average somewhat smaller than those from elsewhere in the range of the subspecies and have rather slender bills. They are uniform in having a decided brownish wash on the upper tail-coverts and edges of the rectrices. This color character appears sporadically throughout all the populations of *Atlapetes brunnei-nucha*; only in eastern Panamá is it characteristic of the majority of individuals examined. Peruvian specimens at the opposite end of the species' range from the Venezuelan "*xanthogenys*" represent the opposite extreme in average color of under parts, but some Peruvian birds are almost as white below as some Venezuelan birds. The large series of specimens from Colombia and Ecuador runs the gamut of variation in color of under parts. Even the grayest of the Peruvian specimens has a greater extent of white ventrally than any Mexican specimen of *A. b. brunnei-nucha*. A color variation occurring somewhat more frequently among the Peruvian specimens than among others examined is the presence of narrow gray edgings to the white feathers of the breast and abdomen, giving a somewhat "scalloped" appearance.

Atlapetes brunnei-nucha inornatus (Sclater and Salvin)

Buarremon inornatus Sclater and Salvin. Ibis, 4th series, 3, 1879:427. Pallatanga, Ecuador.

Characters.—Pectoral band absent. As noted above under *apertus*, *inornatus* differs from that subspecies in having more white, less gray on the under parts, and in possessing the yellow line bordering the brown of the crown. From both *apertus* and *allinornatus*, *inornatus* differs in that a large percentage of specimens exhibits traces of the pectoral band at the sides. I confess that I am completely unable to understand one of the characters listed by Wetmore (1943:336, 337) for *inornatus:* "brown of crown extending only to back of head, not reaching the hind neck . . . ." With the exception of *suttoni*, no subspecies of *Atlapetes brunnei-nucha* appears to me to exhibit any appreciable variation in the line of demarcation between the brown of the crown and the green of the back. The brown

area of the crown of *inornatus* is somewhat restricted, to be sure, but at the anterior rather than the posterior margin. The black area of the crown is increased at the expense of the brown, much as in the banded race *elsae* of Costa Rica.

Measurements.—One male—wing, 77.5; tail, 72.5; bill, 12; 2 females—wing, 76, 79; tail, 72, 73.5; bill, 11.5, 12. Measurements of a slightly larger series, taken from Chapman (1923:253) are here appended; this series includes the four birds listed above, and differences in our respective figures are attributable to different methods of measuring. Males—wing, 74, 74, 79, 79.5; tail, 72, 73, 75; culmen, 17.5, 18, 18.3, 18.3; females—wing, 74, 74, 75, 77; tail, 71, 72, 73, 73; culmen, 17.3, 17.3, 18.

Distribution.—Subtropical zone of the Chimbo—Chanchan river system of western Ecuador.

Specimens examined.—ECUADOR. Coco, Los Llanos, Pallatanga.

Atlapetes brunnei-nucha allinornatus Phelps and Phelps

Atlapetes brunnei-nucha allinornatus Phelps and Phelps, Proc. Biol. Soc. Wash., 62, 1949:120. San Luis, State of Falcón, Venezuela.

Characters.—Pectoral band absent. Similar to *inornatus* of Ecuador, but wing and tail longer. The one specimen of *allinornatus* I examined showed no trace of a rudimentary pectoral band, nor does the original description mention one; such a partial band is often present in *inornatus*. Differs from *apertus* in possessing the yellow margin to the crown (although this is not mentioned in the detailed color description of the type specimen), and in being whiter below.

Measurements.—One male—wing, 83; tail, 84; bill, 11.5. Measurements given by Phelps and Phelps (1949:120), including the specimen above, are as follows: 2 males—wing, 81, 82; tail, 80, 82; culmen from base, 18, 20; 1 female—wing, 80, tail, 81; culmen from base, 19.

Distribution.—"The San Luis mountains of Falcón and Bucaral, Yaracuy [Venezuela], in the Subtropical Zone at altitudes from 1300–1360 meters." (Phelps and Phelps, *loc. cit.*).

Specimen examined.—VENEZUELA. Bucaral.

SUMMARY

The Chestnut-capped Atlapetes (*Atlapetes brunnei-nucha*) is a medium-sized finch inhabiting the Subtropical Zone from central México to southern Perú. Standard ornithological reference works divide this extensive range between two subspecies: *A. b. brunnei-nucha* and *A. b. xanthogenys*, the latter race supposedly confined to the coastal ranges of Venezuela. In addition, there are three forms which differ from typical *brunnei-nucha* by their lack of a black pectoral band. Two of these, *inornatus* of Ecuador and *allinornatus* of Venezuela, have been placed in the species *brunnei-nucha* by earlier authors; the third, *apertus* of Veracruz, is here placed as a race of *brunnei-nucha* for the first time. Differentiation in *Atlapetes brunnei-nucha* has taken place to a greater extent in Central America than in South America, and four new Central American subspecies are described herewith: *suttoni* from Guerrero and Oaxaca, *macrourus* from Chiapas and Guatemala, *alleni* from Honduras, El Salvador and Nicaragua, and *elsae* from Costa Rica and western Panamá. All the South American birds with the black pectoral band are considered to belong to a single, somewhat variable subspecies, for which the name *frontalis* Tschudi is revived; *xanthogenys* Cabanis is considered a synonym.

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Carnegie Museum, Pittsburgh, Pennsylvania, November 9, 1953.

THE NESTING OF THE RIDGWAY TYRANNULET IN SURINAM

By F. HAVERSCHMIDT

According to Hellmayr (1927), the Ridgway Tyrannulet (*Camptostoma obsoletum napaeum*) is confined to the Guianas, the island of Trinidad, Venezuela (except the northwestern section), Eastern Colombia, and northern Brazil. The range of the species, of which a number of races have been described, extends from Costa Rica southward over South America to Bolivia, southeastern Brazil, and northern Argentina. In the coastal region of Surinam, birds of the race *napaeum* are rather common in light forests and perhaps even commoner about coffee plantations and gardens with scattered bushes and trees.

Camptostoma obsoletum is a small tyrannid flycatcher, the weights of specimens collected by me in Surinam being: 3 males, 8, 9.4, and 9.5 grams: 3 females, 10.6, 11.4, and 9.8 grams. The general color above is olive, the crown being darker than the back and inclining to dusky brown. The throat is pale gray and the breast, abdomen, and under tail-coverts are sulphur-yellow. The bird has two yellowish wing-bars and a whitish stripe over the eye. The coloration of the sexes is similar.

Although Euler (1900) and Snethlage (1935) gave good descriptions of nests of *Camptostoma obsolctum* from Brazil, the Penard brothers (1910) and Belcher and Smooker (1937) failed to do so. The Penards in fact gave no description of the nest but, instead, referred the reader to another species, *Phaeomyias murina,* which makes an open nest of the *Elaenia* type. Belcher and Smooker described a nest from Trinidad as "a shallow cup, made of grass stems, fibres and small pieces of bark, and lined with plant down, externally . . . decorated with lichens fastened on with spider's web." This was certainly the nest of another species, probably *Phaeomyias murina,* for *Camptostoma obsoletum* builds a domed nest with a side entrance, as ably described by both Euler and Snethlage (*op. cit.*), and as borne out by my own more recent findings. I had suspected that the nest would prove to be of this type, as the nest of a closely related species, *Camptostoma imberbe,* is well known and is also domed with a side entrance (Bent, 1942).

In Paramaribo, Surinam, I found three nests of *Camptostoma obsoletum,* as follows: Nest A, on October 19, 1949, was a little ball of small dead leaves and fibers with a side entrance (fig. 1), the lining being white plant wool and fibers. It was built among creepers and was very well concealed against the dead stump of a coffee tree in my garden. Nest building was still in progress at that time. Nest B, on December 17, 1949, was situated at a height of about two meters in a Japonica in my garden. It was of exactly the same construction as nest A. It contained two incubated eggs. This was apparently the second nest of the birds from nest A, which was robbed of its single egg on November 2. The distance between the two nests was only about 15 meters. Nest C, found on September 27, 1953, was especially worthy of note in that it was fastened to the lower part of an old nest of *Tolmomyias* (almost certainly *T. flaviventris,* the commonest flatbill in this region), about two meters above ground in a coffee tree. Each nest had the shape of a lengthened ball with the side entrance near its upper end. In figure 1 the difference in the materials of the two nests may be seen; in the upper nest of *Tolmomyias* these consisted of fine dead grass stems and fibers, and in the lowert nest of *Camptostoma* they were mainly of small dead leaves. The entrance of the upper nest was on the side opposite that of the lower one and hence is not visible in figure 1. As is usual in the genus *Tolmomyias* (at least in the species *flaviventris, sulphurescens,* and *poliocephalus*), this structure had been built near a nest of wasps, which, like the *Tol-*

momyias nest, was deserted at the time of finding. Nest C contained two incubated eggs.

At nest A, I watched the building for some time. Only the female took part in construction; the male often sat and sang in a shrub nearby while she was working. On October 19 the female arrived 15 times with nest material when watched from 1:15 until 1:47 p.m. On October 20 the outer part of the nest was finished and the lining of its inner part took place. From 12 until 12:30 p.m. the female brought pieces of white plant wool to the nest seven times. This continued on October 21 when from 6:30 until

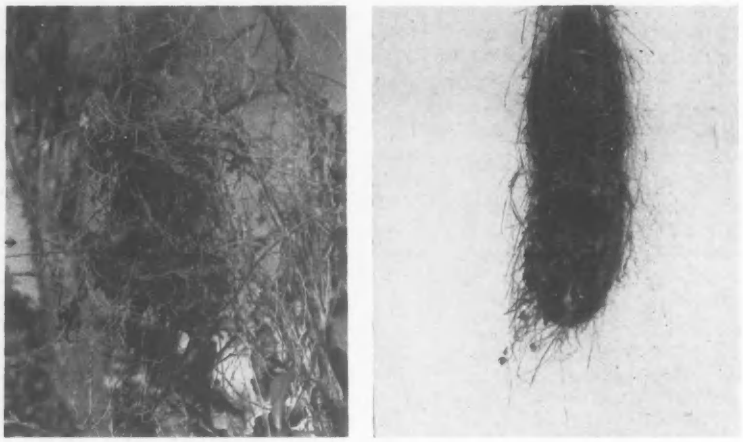

Fig. 1. Nests of *Camptostoma obsoletum*, Paramaribo, Surinam: Nest A (on left) was built among creepers, whereas nest C (on right) was fastened to the lower part of an old nest of *Tolmomyias*.

7 a.m. the female came six times and from 11:39 a.m. until 12:39 a.m., nine times. On October 22 the nest seemed ready for eggs, but the birds were not again seen in its neighborhood until the 25th, when one briefly visited the nest.

On October 26 the first and only egg was laid in nest A. Incubation was noted on the 30th, but on November 2 the nest was empty. The eggs of *Camptostoma obsoletum*, as observed in Surinam, are creamy white with a number of lilac and reddish brown spots especially at the larger end. The measurements of four eggs are: 16.4×12.3 millimeters (nest A); 16.2×12.8, 16.6×12.5 (nest B); and 16.7×12.3 (nest C; one egg broken). The weight of one fresh, unblown egg was 1.35 grams. From these records it seems that the clutch of *Camptostoma obsoletum* consists of one or two eggs, which is characteristic of most of the tyrant flycatchers of this region.

As to the breeding season, these records show that *Camptostoma* breeds in the long dry season (nests A and C) from about mid-August until mid-November, and also in the following short rainy season (nest B) from mid-November until mid-February. Whether the breeding season is more extended, I cannot say at present, and further observations must be awaited. Hellebrekers (1942) mentions a set of two eggs in the Penard collection taken in May, which is in the long rainy season. Because the Penards' description of the nest of *Camptostoma* is incorrect, as previously stated, and because the eggs are described by Hellebrekers as being white without spots, it is better that this record be dismissed.

I have no records of the incubation period, as nest A was robbed a few days after laying, while in nest B incubation was already well in progress. In nests A and B only one bird incubated, probably the female, and nest relief was never seen. On December 22 the two eggs in nest B hatched.

The nestlings were covered with whitish down. Both sexes shared in the feeding of the nestlings and the removal of feces. On December 23, when I watched the nest from 1:15 until 2:15 p.m., the nestlings were fed six times; on the 24th, from 1:05 until 2:05 p.m., three times; on the 28th, from 1:45 until 2:45 p.m., four times; and on December 30, from 1:17 until 2:17, four times. On this last day a hummingbird (*Amazilia fimbriata*), which was constructing a nest nearby, repeatedly pilfered bits of wool from the inner lining of the tyrannulet's nest. The nest was thus destroyed and the nestlings disappeared, as I have described elsewhere (Haverschmidt, 1952).

SUMMARY

1. In *Camptostoma obsoletum*, a tyrannid, the nest is domed with a side entrance and consists of dead leaves and fibers; one nest was found fastened to the lower side of a disused nest of a species of *Tolmomyias*.

2. A nest was built by the female alone, while the male sang nearby.

3. Nests with eggs were found in Surinam in September, October, and December, in both the long dry season and the short rainy season.

4. The clutch consisted of one or two eggs and only one bird, probably the female, incubated.

5. The nestlings were fed by both sexes; two nestlings, as observed when one to eight days old, were fed from three to six times per hour.

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Paramaribo, Surinam, January 8, 1954.

SEASONAL CHANGES IN BILL LENGTH OF CERTAIN PASSERINE BIRDS

By JOHN DAVIS

Seasonal changes in bill length in passerines have been largely ignored by taxonomists. However, some workers have been aware of the possibility that seasonal changes in diet may be reflected in variation of bill length. For example, Miller (1941:183) noted that a Nevada population of the Gray-headed Junco, *Junco caniceps caniceps,* was significantly shorter-billed than a Utah population. He suggested that the difference in bill length might have been the result of diet, since the Nevada birds had been kept from their montane breeding grounds by late snows and were feeding on seeds on barren ground whereas the Utah birds were nesting and were feeding on insects. Marshall (1948:247) noted that bills averaged longer in older series of the Song Sparrow, *Passerella melodia,* taken at San Pablo Bay, California, than in recently collected series from that locality. He stated: "The old collections from San Pablo Bay contain many late summer specimens with long bills, which I believe have grown out due to changes in food utilized at that season." Clancey (1948) reported that bills of specimens of the European Tree Sparrow, *Passer montanus,* taken in late May, June, and July were noticeably attenuated, whereas the bills of specimens taken in autumn and winter were much shorter. Whereas Miller and Marshall implied a direct effect of diet on bill length, Clancey felt that the longer bills of summer specimens were "presumably . . . more advantageous in the rapid acquisition of insect larvae, imagines, etc., upon which the young are reared." He found evidence of the same type of seasonal change in the English Sparrow, *Passer domesticus,* but did not have enough summer specimens to prove this conclusively.

In this study, certain species of passerines were selected which ingest significant amounts of insect material during the spring and summer, and subsist almost entirely on vegetable matter during the autumn and winter. These species were: the Scrub Jay, *Aphelocoma coerulescens,* represented by the subspecies *obscura* and *insularis*; the English Sparrow, *Passer domesticus,* represented by samples drawn from the populations of Berkeley and Los Angeles, California; the Brewer Blackbird, *Euphagus cyanocephalus*; the Tri-colored Blackbird, *Agelaius tricolor*; the Red-winged Blackbird, *Agelaius phoeniceus,* represented by the subspecies *californicus* and *nevadensis*; the Brown Towhee, *Pipilo fuscus,* represented by the subspecies *carolae, petulans, senicula, albigula,* and *mesoleucus*; the Sierra Nevada Oregon Junco, *Junco oreganus thurberi*; the Chipping Sparrow, *Spizella passerina,* represented by the subspecies *arizonae* and *mexicana*; and the Song Sparrow, *Passerella melodia,* represented by the subspecies *morphna, gouldii, cooperi,* and *pectoralis.*

Since the diets of these species have been ascertained from detailed analyses of stomach contents, the records available represent the actual consumption of food by individuals regardless of what these individuals might feed to their young during the breeding season. The nature of the diets of the selected species was determined from analyses of stomach contents as reported by Barrows (1889), Beal (1910), Kalmbach (1940), and Soriano (1931).

Bills were measured from the anterior edge of the nostril to the tip in winter- and summer-taken samples of each population. The measurements were treated statistically in samples of 10 or more when seasonal averages differed so widely as to indicate possible significance. Winter samples were composed of birds taken in December and January when sufficient material was available. First-year and adult birds were not separated, since it was assumed that the bill is full-grown in first-year passerines by De-

cember. This is true of *Pipilo fuscus* (Davis, 1951:5) and *Passerella melodia* (Marshall, 1948:242). When winter specimens taken earlier than December were included, only adults were used. Summer samples were collected in May, June, and July.

In addition to species which change their diets seasonally, winter and summer samples of the House Finch, *Carpodacus mexicanus frontalis*, collected in California, were measured as a control. According to Beal (1907:17, 18) this species lives almost entirely on weed seeds and fruit in California, and does not ingest more than a trace of animal matter at any time of year. Further, analyses of the stomach contents of nestlings indicate that the adults feed the young a diet that is similar to their own. The measurements of all species are presented in table 1.

DISCUSSION

Examination of the figures presented in table 1 shows a definite tendency toward increase in bill length in summer in all species except *Carpodacus mexicanus* and *Aphelocoma coerulescens*. The latter species has dietary peculiarities which will be discussed later in this paper. Although many of the average differences between winter and summer samples are not statistically significant, the tendency toward increase in bill length in summer in nearly all samples is biologically significant. This biological significance is enhanced by the fact that seasonal changes in bill length are evident in samples of both males and females in the populations analyzed.

Two explanations for increase in bill length in summer may be suggested. First, it may be a secondary sex character. The bills of the English Sparrow, especially of the male, and of both sexes of the Chipping Sparrow undergo marked color changes during the breeding season. In the English Sparrow this color change has been demonstrated to be under the control of the male hormone (Keck, 1932), and it is possible that changes in bill configuration are under similar control. However, increase in bill length is more pronounced in the Song Sparrow than in any of the other species studied, and there is no seasonal change in bill color in this species. Therefore it seems unlikely that increase in bill length is associated with reproductive physiology.

Second, it may be that seasonal changes in bill length are associated in some way with seasonal changes in diet. Support is given this idea by the fact that, with the exception of the Scrub Jay, bills average longer in summer samples of all the species which ingest large numbers of insects in the spring and summer, but do not in the one species which never eats insects in large amounts, the House Finch.

If the bill does respond to seasonal variation in diet, three possibilities must be considered. First, increase in bill length in summer is of adaptive significance in that it enables parent birds to catch more easily the insects that are to be ingested, or fed to the young, as suggested by Clancey (1948). This seems unlikely because of the variability in the degree of seasonal differences between samples of the same species, or subspecies. Thus, in *Pipilo fuscus*, in the races *carolae* and *albigula*, the average differences between summer and winter males are of such low order that the samples may be considered identical. In *P. f. petulans* the average difference between summer and winter males is significant. In *Spizella passerina mexicana* the difference between seasonal samples of males is significant, whereas it is so low between the female samples that they may be considered identical. Such wide amplitude of variation suggests that seasonal variation in bill length is influenced by some variable environmental factor rather than by the genetic make-up of the individual. The seasonal appearance of insects, which make up most of the animal portion of the diets of the species studied, would be just such a variable factor, depending in large part on the time of onset of rising spring temperatures. A case in point is that of *Junco c. caniceps* as described by Miller (1941). Had it not been for late snows, the short-billed Nevada birds would have been on the

breeding grounds and subsisting on insects rather than on seeds. It is possible that had the unseasonal snows fallen in the Utah breeding grounds, the situation would have been reversed. If seasonal change in bill length were under genetic control, annual variation in environmental factors would be of little importance, and the degree of difference between seasonal samples would probably be less variable. In my opinion, any advantage given by longer bills in summer is purely coincidental.

A second possibility is that the bills elongate because of the higher intake of animal protein during the summer. This possibility cannot be dismissed until checked by controlled feeding experiments.

The third possibility is that seasonal change in bill length is merely a reflection of the mechanical wear on the constantly growing bill tip caused by different foods. When

Table 1

Seasonal Differences in Bill Measurements

Season	Sex	Number	Mean	Standard error	Number	Mean	Standard error
		Aphelocoma c. obscura			*Aphelocoma c. insularis*		
Winter, adults	♂	7	21.00	.....	20	23.86	0.22
April, adults	♂	14	20.04	0.16	13	22.85	0.17
April, 1st year	♂	10	19.10	0.32	18	23.07	0.19
Summer, adult and 1st year	♂	9	19.30	.....	15	23.49	0.28
Winter, adults	♀	8	18.31	.....	22	22.07	0.29
April, adults	♀	....	.....	.....	10	21.96	0.17
Summer, adult and 1st year	♀	16	17.76	0.21	6	22.88	.....
		Passer domesticus, Berkeley			*Passer domesticus*, Pasadena		
Winter	♂	12	9.29	0.10	15	9.41	0.13
Summer	♂	14	9.69	0.10	14	9.97	0.11
Winter	♀	11	9.21	0.10	14	9.29	0.11
Summer	♀	11	9.55	0.11	10	9.63	0.10
		Euphagus cyanocephalus			*Agelaius tricolor*		
Winter	♂	24	13.83	0.14	10	16.56	0.34
Summer	♂	22	15.01	0.18	20	17.05	0.20
Winter	♀	22	12.82	0.14	11	13.95	0.17
Summer	♀	22	13.30	0.17	26	14.26	0.16
		Agelaius p. californicus			*Agelaius p. nevadensis*		
Winter	♂	11	15.39	.....	20	16.23	0.18
Summer	♂	27	15.60	.....	25	16.74	0.18
Winter	♀	24	12.48	0.11	12	13.30	0.24
Summer	♀	24	12.92	0.14	25	13.92	0.12
		Carpodacus m. frontalis			*Pipilo f. carolae*		
Winter	♂	25	8.26	.....	25	10.96	.....
Summer	♂	25	8.20	.....	49	11.01	.....
Winter	♀	23	8.25	.....	19	10.73	0.12
Summer	♀	18	8.15	.....	27	10.96	0.09
		Pipilo f. petulans			*Pipilo f. senicula*		
Winter	♂	27	10.43	0.07	19	9.89	0.08
Summer	♂	16	10.89	0.10	17	10.15	0.13
Winter	♀	18	10.36	0.08	11	9.66	0.12
Summer	♀	12	10.67	0.12	10	10.17	0.12
		Pipilo f. albigula			*Pipilo f. mesoleucus*		
Winter	♂	12	10.63	.....	24	10.43	0.08
Summer	♂	21	10.64	.....	33	10.83	0.07
Winter	♀	12	10.43	0.10	20	10.37	0.07
Summer	♀	20	10.63	0.06	10	10.71	0.20

Table 1 *(continued)*

Season	Sex	Number	Mean	Standard error	Number	Mean	Standard error
		Spizella p. mexicana			*Spizella p. arizonae*		
Winter	♂	13	7.15	0.08	15	7.15	0.09
Summer	♂	26	7.49	0.06	26	7.44	0.06
Winter	♀	10	7.21	.....	13	6.99	0.07
Summer	♀	15	7.24	.....	25	7.29	0.07
		Passerella m. morphna			*Passerella m. gouldii*		
Winter	♂	17	8.74	0.08	20	8.41	0.07
Summer	♂	26	9.27	0.08	27	9.14	0.06
Winter	♀	20	8.65	0.08	14	8.49	0.07
Summer	♀	25	9.22	0.04	17	8.95	0.08
		Passerella m. cooperi			*Passerella m. pectoralis*		
Winter	♂	21	8.39	0.06	8	9.24	.....
Summer	♂	22	8.79	0.07	13	9.85	0.06
Winter	♀	6	8.10	.....	8	9.15	.....
Summer	♀	16	8.53	0.07	3	9.50	.....
		Junco o. thurberi					
Winter	♂	25	7.78	0.06	....	.....	.....
Summer	♂	25	7.98	0.06	....	.....	.....
Winter	♀	25	7.74	0.05	....	.....	.....
Summer	♀	25	7.92	0.06	....	.....	.....

foods with a highly abrasive effect are consumed in large amounts, the bill tip is worn down, and when such foods are taken in smaller amounts, the bill tip tends to elongate. Except for the Scrub Jay, all the species studied which consume insects in the summer subsist primarily on weed seeds and/or grain during the winter. During the summer appreciable amounts of insect material are eaten with a concomitant decrease in seed consumption. Increased consumption of insects could reduce wear on the bill tip in two ways. First, soft-bodied insects such as aphids, and soft-bodied insect larvae, would have less of a wearing effect on the bill tip than would hard-shelled seeds. Secondly, the individual items of food are larger when the birds are eating insects, and the bill tip would thus be used less frequently in the course of gathering food than when the birds are obtaining weed seeds or grain. These factors would be partially minimized during parts of the summer months when parents would be foraging for their nestlings or fledglings as well as for themselves. However, in most passerine species the young are fed a diet rich in animal matter. Foraging for the young would be of more importance in a species such as the House Finch, which feeds its young a diet composed almost entirely of weed seeds. Although this species never includes more than a trace of animal matter in its diet, it does have a seasonal change in diet. According to Beal (1907:18), fruit constituted between 13.4 and 27.4 per cent of the diet from June through October, and between 0.0 and 8.3 per cent from November through May. Since fruit would probably induce less wear on the bill tip than the weed seeds which made up almost the entire remainder of the diet, some increase in bill length might be expected during the summer and early fall, when consumption of fruit is increased. However, analysis of the stomach contents of 46 nestlings (*op. cit.*:21) indicated that 97.6 per cent of their diet was weed seeds. Although actual consumption of weed seeds by breeding adults and first-year birds may have been less from June through October, parents were gathering large quantities of this food for their young during much of this time, and this probably offset the reduced amount of wear put on the bill by the summer diet. Some increase in bill length might be expected in September and October, when fruit is still being eaten in significant amounts and the young are no longer dependent on the parents. The fact that bill length

averages very slightly longer in the winter samples of both sexes (table 1) may be a reflection of autumnal bill growth.

The peculiar pattern of seasonal change in bill length in the Scrub Jay lends support to the hypothesis of mechanical wear. In the analysis of bill length variation in this species, winter samples were made up of adults only, since Pitelka (1951:199) has indicated a tendency for the bills of adult *Aphelocoma* to measure longer than the bills of first-year birds. The measurements of April samples of adult and first-year male *A. c. insularis* indicate that first-year birds attain full bill growth by April at the latest, and first-year birds, when available, were included in spring and summer samples of *A. c. obscura* and in summer samples of *insularis*. It will be noted (table 1) that in the males of *obscura*, the bill steadily decreases in length from September through April, and begins to elongate in summer. In both males and females of this subspecies, the bill is longer in winter than in summer. In *A. c. insularis* the pattern is similar in both sexes in that the bill decreases from winter through April, and elongates in summer. In the males of *insularis*, the summer bill has not yet become as long as the winter bill, but in the females it is longer. The fact that the bill is longer in winter than in summer in three of four samples appears at first glance to reverse the trend established in those species with seasonal change in diet. However, this may very possibly be explained by the fact that the Scrub Jay subsists during the fall and winter primarily on acorns rather than on seeds, and during the late spring and summer primarily on fruit and animal matter. In the stomach contents analyzed by Beal (1910:54) acorns varied between 0.19 and 2.22 per cent of the total diet from May through August. In September acorns made up 31.65 per cent of the diet, from October through February between 66.29 and 88.57 per cent, in March 27 per cent, and in April, 24.75 per cent. Fruit was consumed mainly from May through August, forming between 44.94 and 61.41 per cent of the diet. These figures for fruit are probably high for the species in California, as Beal (*op. cit.*:51) stated that as many of his specimens as possible were collected near buildings and orchards. Consumption of animal food was greatest in April (70.25 per cent) and then gradually decreased to a minimum of 5 per cent in January. From May through August animal matter formed between 32.53 and 36.45 per cent of the diet.

The pattern of seasonal variation in bill length in the Scrub Jay may possibly be explained by the great amount of wear on the bill tip involved in pounding and cracking acorns and extracting the meats from the broken husks. When the diet is low in acorns and high in fruit and animal matter, the bill probably elongates. This period of growth would last from May through August, during which month the bill would presumably reach maximum size. In September, when acorns, animal matter, and fruit are consumed in significant amounts (31.65, 24.20, and 19.89 per cent, respectively) the bill probably remains at, or near, the maximum. Heavy wear is put on the bill starting in October and continues through the winter. Thus in male *obscura* the September-October sample averages longer than the winter sample. The bill probably reaches minimum length in February, the last month during which acorns are eaten in large amount. In March, the birds are on a diet which is still mainly vegetable, and the bill probably remains at, or near, the minimum. In April, with consumption of animal matter at its high for the year, there may be some elongation, although this would be slight because one-fourth of the diet is still acorns. Thus, the March-April samples in male *obscura* and in both sexes of *insularis* average shorter than the winter samples. Pronounced and steady bill growth presumably occurs from May through August, when acorns are eaten in small amounts and fruit and animal matter form the bulk of the diet. Thus, the summer samples in male *obscura* and in both sexes of *insularis* average longer than the March-April samples. In both sexes of *obscura*, and in male *insularis*, the summer sam-

ples, based on specimens taken in May, June, and July, do not average as long as the winter samples, although pure samples of late summer birds would probably average longer than the winter samples. In female *insularis* the summer sample has surpassed the winter sample in average length.

In brief, it appears as though the unusual amount of wear imposed on the bill tip by the acorn-rich winter diet postpones the attainment of maximum bill length in the Scrub Jay until late summer, whereas in the other species considered, in which the wear engendered by the winter diet is less severe, the bill surpasses the winter average earlier in the summer. The peculiar pattern of seasonal bill change in the Scrub Jay, and the probable correlation of this pattern with the unusually abrasive winter diet of this species, suggests that seasonal changes in bill length in the species treated in this paper result directly from the mechanical wear on the bill tip caused by different foodstuffs which are eaten at different times of the year.

Seasonal change must be taken into account in the analysis of geographic variation in bill length in species which change the diet seasonally. For example, Lack (1940) analyzed variation in bill length in *Passer domesticus* from various localities in North America, using the bills of black-throated males without regard for age or seasonal variation. This species is one in which there is marked seasonal change in bill length; and in order to be strictly comparable, samples should be composed of either winter or summer specimens. Lack found that bill length in a sample from southern California and Baja California averaged significantly longer than in samples taken elsewhere in North America. He concluded that some evolution might have taken place in this species since its arrival in southern California. In the present study samples were analyzed from Berkeley, California, one of Lack's localities, and Pasadena, California. The latter sample takes in only a small part of the total geographic area included in Lack's southern California and Baja California sample, since this included birds taken as far north as Fresno County, and as far south as Baja California. The samples used in this study are much smaller than Lack's, because of geographic restriction, seasonal segregation, and the elimination of fall specimens. If summer samples from Pasadena are compared to winter samples from Berkeley, the average differences in bill length are significant in both sexes. If samples are compared on a seasonal basis, the Pasadena samples average longer, but not significantly so. Thus, the variation described by Lack should be checked in large series of seasonally comparable specimens before any conclusions are drawn.

In addition to seasonal change in bill length in the English Sparrow, there is also increased downgrowth of the tomia of the upper mandible in some birds in spring and summer. This growth results in the formation of prominent flanges on the central portions of the upper tomia which overlap the lower mandible by as much as one millimeter. In some birds these flanges are produced bilaterally, and in others there may be only one such flange, on either side. Of 52 individuals either breeding or coming into breeding condition, trapped near Pasadena between March 14 and July 15, 1953, six (11.5 per cent) bear such flanges on the bill. Of these, three are male and three are female. Of the males, two bear a single flange on the left side, and one bears a single flange on the right side. There may be some yearly variation in the frequency of occurrence of individuals with tomial downgrowth, since it appeared in none of 25 breeding adults trapped near Pasadena between June 3 and July 31, 1952. Three juveniles, one male and two unsexed, with bilateral flanges, were trapped in May and July, 1953. One juvenal male with bilateral flanges was trapped on June 21, 1952. Many other juveniles were trapped in 1952 but were not examined for this character, so that no conclusions may be drawn as to the relative frequency of occurrence of tomial downgrowth in juveniles in 1952 and 1953.

It was thought advisable to check the validity of a recently named subspecies of the White-throated Towhee, *Pipilo rutilus parvirostris* Davis (1951:84). This race was differentiated from *P. r. rutilus* mainly on the basis of shorter bill length. Although nothing is known of the food habits of *Pipilo rutilus,* it is closely related to *Pipilo fuscus,* a species which, at least in California, has a definite seasonal change in diet. The bulk of the material on which *parvirostris* was based was taken between September and December, whereas the bulk of the series of the nominate race with which it was compared was taken between May and July. The average bill length of 12 male *parvirostris* taken in October, November, and December is 10.35 mm., of three taken in April 10.50 mm., and a single male taken in July has a bill 10.8 mm. long. The average bill length of seven females taken in October, November, and December is 10.26 mm., and of the two taken in July 10.70 mm. Nineteen male *rutilus* taken in May, June, and July have an average bill length of 11.15 mm., and a single male taken in December has a bill 10.2 mm. long. Twelve summer females average 10.62 mm., nine February females average 10.82 mm., and a single December female has a bill 10.4 mm. long. Unfortunately, summer samples of *parvirostris* and winter samples of *rutilus* are too small to indicate definitely seasonal changes in bill length within each race. The material at hand does indicate the possibility of such change. It is hoped that further collecting will provide sufficient material to settle this matter.

Another type of variation affected by seasonal change in bill length is the degree of sexual dimorphism. This is well exemplified by the four races of *Passerella melodia* (table 1). In each race, the bill of summer females averages longer than the bill of winter males. When the samples are compared on a seasonal basis it is seen that in all cases except one, winter *gouldii,* the male samples average longer than the female samples.

Thus, it is apparent that when critical analyses of variation in bill length are undertaken, the possibility of seasonal change must be considered. Even if there is no information on the diet of the particular species concerned, the largest available sample should be checked for evidence of seasonal bill changes.

SUMMARY

1. Summer increase in bill length is demonstrable in certain passerine species which eat significant amounts of insects in summer, but are almost entirely vegetarian in winter.

2. The most likely cause of increase in bill length in summer is the reduced amount of wear put on the constantly growing bill tip by a diet rich in insects.

3. Seasonal changes must be taken into consideration when analyses are made of geographic variation in bill length of species which have a seasonal change in diet.

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Hastings Natural History Reservation, Carmel Valley, California, January 4, 1954.

VICTIMS OF THE BROWN-HEADED COWBIRD IN WHITMAN COUNTY, WASHINGTON

By JAMES R. KING

The Brown-headed Cowbird (*Molothrus ater artemisiae*) is a fairly common summer resident in suitable habitats throughout eastern Washington, but it seems to attain relatively high population densities in the Palouse hills of Whitman County, as Snodgrass (1904) has previously noted. In this area the Cowbird is a regular member of the summer avifauna of deciduous flood-plain forest, willow-hawthorn riparian thickets beset with taller trees, and the open ponderosa pine woodland. However, very little is known of the breeding economy of this interesting brood parasite despite its local relative abundance, and the literature provides only a rudimentary list of its known victims in this area. Various observers (*in* Jewett, *et al.*, 1953:593-594) have reported Cowbird eggs in the nests of the Yellow Warbler (*Dendroica petechia*), Yellow-breasted Chat (*Icteria virens*), Yellow-throat (*Geothlypis trichas*), Tolmie Warbler (*Oporornis tolmiei*), Warbling Vireo (*Vireo gilvus*), Lazuli Bunting (*Passerina amoena*), and Chipping Sparrow (*Spizella passerina*). Bendire (1895:435) recorded the Fox Sparrow (*Passerella iliaca*) as a host species at Palouse Falls, Whitman County, and Bowles (*in* Friedmann, 1931:31) also reports parasitized nests of the "Slate-colored Fox Sparrow" (*P. i. schistacea*) found near Spokane.

The observations of the Cowbird and its victims described below were made principally while I was engaged in a general survey of breeding birds during 1952 in a tract of approximately two hundred square miles in area extending northwestward from Pullman, Whitman County. A few additional observations, particularly with regard to the Traill Flycatcher (*Empidonax traillii*) as a potential Cowbird victim, were made in this same study tract during 1953. Although these data add only five species to the total of known Cowbird victims in Washington, they define to some extent the degree of parasitism and describe certain host-parasite relationships. The Cowbird hosts discovered in the study tract, and the extent to which they were parasitized, are summarized in table 1.

A total of 349 nests of 44 passerine species was examined in the course of the field work. Seventeen (4.9 per cent) of these nests contained one or more Cowbird eggs. The incidence of parasitism of the ten known host species was found to be 13.2 per cent. In addition, a pair of Warbling Vireos (*Vireo gilvus*) was observed feeding a newly fledged Cowbird on July 8, 1952, thus increasing the total of known hosts in the study tract to 11 species. This list, it should be emphasized, is not proposed as a complete one. My field work has yielded nesting records of only 76 per cent of the approximately fifty-eight passerine species considered to be the normal passerine complement of the breeding avifauna of the study tract. Such potential Cowbird victims as the Spotted Towhee, Vesper Sparrow, Redstart, and others are in need of further investigation.

Migrant Cowbirds were first observed in the Palouse hills of Whitman County on May 13 in 1952, and, as might be anticipated because of the much-retarded season, on May 23 in 1953. These birds, during both years, were engaged in vigorous courtship when first observed. Fresh-egg dates for 18 Cowbird eggs in 1952 extended from May 14 ±2 days to July 4 ±2 days. Two eggs observed in 1953 were fresh or only slightly incubated on May 27 and June 25. Bowles (1921:10) reports June 5 as the mean fresh-egg date for the Cowbird in Washington. The relationship of the Cowbird fresh-egg season to that of its hosts in 1952 is shown in figure 1. The earliest and latest dates of fresh,

complete clutches, which the arrowheads indicate in the case of the host species, were derived by a process of extrapolation from the known or closely estimated age of the nest contents at some stage of their development, and upon a knowledge of the incubation and nesting periods and normal variations thereof. In the case of the Cowbird the incubation period is taken as 11-13 days (Norris, 1947:95), and the nestling period as 8-10 days (Norris, 1947:96; Friedmann, 1929:265). The determination of the age of nestling Cowbirds was based on descriptions of growth given by Norris (1947:95*ff.*) and Friedmann (1929:260*ff.*).

Table 1

Victims of the Brown-headed Cowbird and the Incidence of Parasitism, 1952–1953, in Whitman County, Washington

Host species	Total nests	Parasitized nests	Nests with 1 Cowbird egg	Nests with 2 Cowbird eggs
Empidonax traillii brewsteri	44	2 (4.5%)	2	....
Hylocichla fuscescens salicicola	6	1 (16.7%)	1	....
Oporornis tolmiei tolmiei	5	1 (20.0%)	....	1
Geothlypis trichas campicola	1	1	1	....
Dendroica petechia morcomi	7	1 (14.3%)	1	....
Agelaius phoeniceus nevadensis	24	3 (12.5%)	3	....
Euphagus cyanocephalus	15	1 (6.7%)	1	....
Passerina amoena	3	2 (66.7%)	1	1
Spizella passerina arizonae	14	2 (14.3%)	2	....
Melospiza melodia ssp.	10	3 (33.3%)	2	1
	129	17 (13.2%)	14	6

Although it is tempting, on the basis of relative fresh-egg spans and habitat distributions, to advance certain generalizations concerning host-Cowbird relationships, I do not feel that the extent of the present data justifies this action. Some limited remarks concerning specific relationships, however, are indicated.

Empidonax traillii. Traill Flycatcher. The habitat distribution of this species and that of the Cowbird are, for the major part, co-extensive. Egg deposition by Traill Flycatchers, however, did not begin in 1952 or 1953 until considerably after the height of the Cowbird's egg-laying season had passed. This may in part account for the low incidence of parasitism, although, as Friedmann (1929:209) notes, western races of *E. traillii* are apparently not commonly victimized by the Cowbird except in Colorado and southern California. Cowbird parasitism of *E. traillii* in the East has been reported, in different areas, as 8.1 per cent (Berger, 1951:28), 21 per cent (Hicks, 1934:386; Berger and Parmelee, 1952:37), and 56.2 per cent (9 out of 16 nests; Trautman, 1940: 269). The incidence of parasitism during both years of the present study was 4.5 per cent (1 out of 22 nests).

Dendroica petechia. Yellow Warbler. This is the most common warbler of the Palouse hills, but unlike its eastern races, *morcomi* apparently suffers only moderate parasitism. Of the approximately forty fledged families of this species which I recorded during my field work, only one was seen to contain a juvenal Cowbird (July 5, 1953). Eastern races, however, are among the most common Cowbird hosts, and parasitism frequencies of 42 per cent and 40.9 per cent have been reported by Hicks (1934:386) and Berger (1951:28), respectively. There is no apparent ecological reason for the comparatively low incidence (14.3 per cent) observed in the present study area, since both the breeding cycles and habitat distributions of the two species overlap to a high degree.

It should be realized, however, that the present study tract lies near the western periphery of the range of *Molothrus ater* and that the population density of the species here is doubtless considerably less than that attained at points near its center of abundance in the Midwest. Nor should the fact be disregarded that actual interracial differences in host-parasite relationship may occur. The literature references cited above relate to *Molothrus ater ater*.

Oporornis tolmiei. Tolmie Warbler. Friedmann (1929:248; 1934:104) reports three records of the Tolmie Warbler as a Cowbird victim in California, Colorado, and

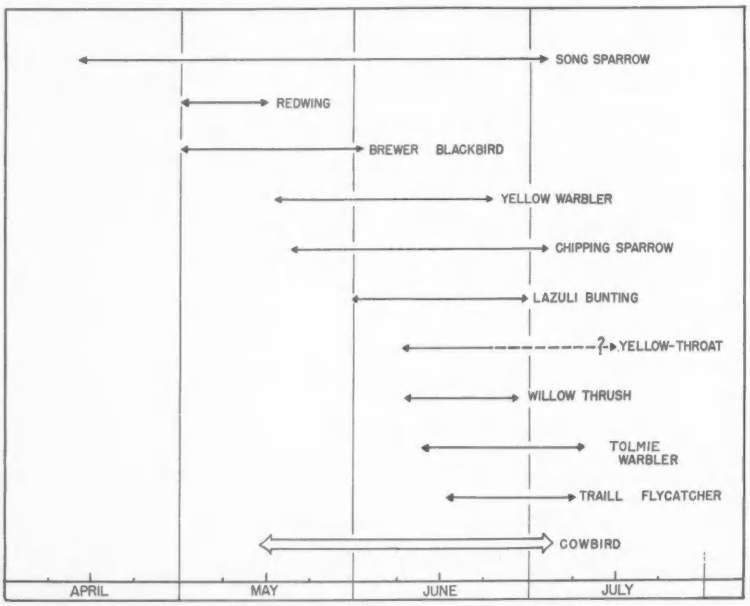

Fig. 1. Fresh-egg seasons of the Cowbird and its hosts in Whitman County, Washington, in 1952.

British Columbia. Bent (1953:539) gives four records from unspecified sources. Sloanaker (*in* Jewett, *et al.*, 1953:594) reports this species as a Cowbird victim near Spokane, Washington. In addition to the parasitized nest noted in table 1, I observed two nearly full-grown juvenal Cowbirds being fed by a pair of Tolmie Warblers on July 13, 1952. In view of the overlap of breeding cycles and of habitat distributions of these two species in the study tract in 1952, it is probable that the incidence of parasitism indicated in table 1 is approximately correct.

Agelaius phoeniceus. Redwing. The fresh-egg season of this species and that of the Cowbird overlapped by only three or four days in 1952. As would be predicted, only the very latest Redwing nests were parasitized. In other years the fresh-egg span of the Redwing is not so restricted, and the degree of overlap with that of the Cowbird is considerably greater. In 1953, for instance, egg deposition began in one Redwing nesting group at the end of the second week of May, and in another group during the fourth week of May. The egg-laying period of the Cowbird during this year extended from

about May 27 to at least June 25; hence the degree of overlap in the breeding cycles of these two species was extensive. Despite this condition, the amount of observed parasitism during the two years was equal (12.5 per cent). It should be pointed out, however, that my observations at Redwing nests during 1953, unlike those of 1952, were confined to an early part of the season, prior to the height of Cowbird breeding activity. It is possible, and probable, therefore, that the actual incidence of parasitism during 1953 was greater than that observed.

Euphagus cyanocephalus. Brewer Blackbird. In view of the comments of various authors (*in* Friedmann, 1929:215) on the rather heavy parasitism suffered by this species in the West, the low level of parasitism (6.7 per cent) reported here may be regarded as unusual, since the habitats and, ostensibly, the fresh-egg seasons of the two species overlap. However, in re-examining my nesting records of the Brewer Blackbirds, I find that 75 per cent of the clutches were complete and well incubated by May 12, 1952, leaving only late nesters and re-nesters as potential Cowbird victims during that year. The single parasitized nest was found, with fresh eggs, on May 31.

Passerina amoena. Lazuli Bunting. The nesting data in table 1 indicate that this species is very heavily parasitized by the Cowbird. In view of the fact that only three nests were found, it might be suspected that, on the basis of chance, an atypically large proportion of parasitized nests was observed. This suspicion would be fortified by Friedmann's (1929:231) remark that the Lazuli Bunting is an uncommon victim. However, juvenal Cowbirds were observed on four occasions during 1952 in fledged families of Lazuli Buntings, making it apparent that this relationship was decidedly not an uncommon one.

Spizella passerina. Chipping Sparrow. This bird, considering its abundance in the Palouse hills, suffers comparatively little from the habits of the Cowbird, even though the breeding cycles, including both of the annual broods of the Chipping Sparrow, are coincident. Parasitism frequencies of about 15 per cent and 11.1 per cent have been found for *S. p. passerina* in New York and Pennsylvania by Friedmann (1929:221) and Norris (1947:90), respectively. Although these data compare rather closely with the observed incidence in the Palouse hills (14.3 per cent), Berger (1951:28) and Hicks (1934:386) report parasitism frequencies of 62.5 per cent and 53 per cent in Michigan and Ohio. On the study tract the habitat distributions of the Cowbird and the Chipping Sparrow overlap only slightly. Cowbird populations attain their greatest density in stream valleys providing tall trees for perching, and the species is uncommon or absent in the comparatively treeless uplands, occurring in only relatively small numbers in timber tracts and along the edges of ponderosa pine woodlands. Occasionally Cowbirds utilize telephone poles as perches in the uplands. The Chipping Sparrow, on the other hand, is pre-eminently an upland bird, reaching its greatest abundance in ninebark (*Physocarpus malvaceus*) thickets and the understory of the open ponderosa pine woods, and extending in lesser numbers into upland hawthorn (*Crataegus douglasii*) and rose (*Rosa* sp.) thickets. The major habitats of the parasite and its host overlap, then, only to a comparatively minor extent, and it is pertinent to note that the two parasitized nests of the Chipping Sparrow were both found where open brushland abutted on stands of box elder (*Acer negundo*) or black cottonwood (*Populus trichocarpa*).

In conclusion, the reader will note that this paper has emphasized the temporal and spatial factors which, together with population density, contribute to the availability of host species. This does not imply a depreciation of the other ecological, physiological, and behavioral factors whose interaction determines the suitability of a potential host

species as a foster parent of the Cowbird, but results simply from the restricted scope of the present paper and from our essentially fragmentary knowledge of the breeding ecology of the Cowbird.

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SUMMERING BIRDS OF ZACATECAS, MEXICO, WITH A DESCRIPTION OF A NEW RACE OF WORTHEN SPARROW

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Although Zacatecas is the seventh largest state in México, information relating to its bird life is meager. This is shown by the fact that a brief trip to that state made by the senior author in the summer of 1950 resulted in the recording of eight species of birds not previously reported there (Webster and Orr, 1952). In the summer of 1952 Webster made two additional short trips to western and central Zacatecas. On the first of these he was accompanied by his wife, Juanita R. Webster. Later he returned with Dr. Ernest P. Edwards, Mr. Stephen L. Russell, and Mr. and Mrs. Arnold Weinberg. All localities visited are in either the "mesquite-grassland" or the "pine-oak forest" zones of Leopold (1950), and all are in the northwestern or west-central part of the state.

From June 17 to 19, 1952, field work was carried on 3 miles east of Cerro Gordo, at 8000 feet just inside the northwestern boundary of the state. In the immediate vicinity of this camp juniper predominated, with some piñon and mesquite scattered about. Within a mile to the south and east the trees and brush thinned out and gave way to open grassland. To the west there was a rise to the oak-clad peak of Cerro Gordo and to the north were a creek, some wheat fields, and piñon-covered ridges. Part of June 19 and most of June 20 were spent 3 miles southeast of Sain Alto, 6900 feet, in mesquite-prickly pear association, and along the Río Atotnilco about one mile south of Sain Alto where there was a heavy growth of cottonwood and willow. A return was made to the first camp near Cerro Gordo the evening of June 20 and collecting was done there the next day.

On July 11 the senior author and party camped overnight along the Río Florido (= Río Trujillo), 16 miles north-northwest of Fresnillo, at 6500 feet, beside riparian growth of cottonwood and willow. From July 12 to 17 camp was established at Laguna Valderama, 56 miles by truck trail west of Fresnillo. The laguna has been dry since 1945 and is now a prairie, about four by ten miles in dimension. Most of it is now grown to short bunch grass. The camp site selected was east of the prairie in a ravine at 7900 feet where there was a curious mixture of trees—juniper and yellow pine in the bottom, and oak, manzanita, juniper, and piñon on the slopes. Farther east, and higher, yellow pine and oak predominated, while on the highest peak in this vicinity (about 9300 feet) there was oak, yellow pine, and madrone. On July 13 and 14 Edwards and Russell made a trip by jeep 15 miles to the west of Milpillas and then southwest another 15 miles to Rancho Hornillas. They found most of the route from Laguna Valderama to Milpillas to be through gently rolling oak-savannah. From Milpillas to Rancho Hornillas it was mostly pine-oak woodland. Río Florido was revisited on July 17 and 18.

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In the following annotated list an asterisk indicates that, in so far as the authors are aware, the species or subspecies so marked has not heretofore been recorded from the state of Zacatecas. Unless otherwise indicated, dates listed are for 1952 and specimens referred to are in the collection of the California Academy of Sciences.

**Cyrtonyx montezumae mearnsi.* Montezuma Quail. A female taken at Laguna Valderama on July 17 and another at Hornillas on July 14, the latter with an egg in the oviduct, match perfectly specimens from southern Durango. They are somewhat darker, less gray, than examples of *mearnsi* from Arizona, New Mexico and Chihuahua, but they are not nearly as dark as females of *montezumae* from Tamaulipas, San Luis Potosí, and Michoacán in the Museum of Vertebrate Zoology. One to three birds were seen each day at Laguna Valderama and Hornillas, July 12 to 17.

**Bubo virginianus mayensis.* Horned Owl. At Laguna Valderama the hoot of this owl was heard each evening, from July 12 to 14. On July 15 a crowd of excited birds, including Ultramarine Jays, Painted Redstarts, and Bridled Titmice, directed our attention to a Horned Owl in an oak-grown ravine above camp. This bird proved to be a very large (wing 378 mm.), dark male. It is darker and larger, in fact, than any of the 30-odd Mexican specimens with which it was compared, and as dark as the darkest specimen of 31 examples of *pacificus*.

**Glaucidium gnoma gnoma.* Pygmy Owl. An adult female in pale red phase was taken in daylight on July 14 at Laguna Valderama.

**Otus trichopsis trichopsis.* Spotted Screech Owl. At Laguna Valderama the soft notes of this owl were heard every evening, from July 12 to 16. On the evening of July 12 it was estimated that at least 15 individuals could be heard from camp. The number diminished, however, on subsequent evenings. An adult female was taken on July 13 and a juvenile on July 17.

Centurus aurifrons aurifrons. Golden-fronted Woodpecker. On June 19 two were seen in mesquite near the creek 3 miles southwest of Sombrerete. Several were seen in the willow-cottonwood association beside the Río Atotnilco on June 20, and along the Río Florido on July 12, 17, and 18. An adult female was taken July 18 at Río Florido, where it had been incubating a set of eggs in a tall cottonwood. The specimen is of the brown-bellied, black-backed type found in the central Mexican highlands, as implied but not definitely listed by Wetmore (1948).

**Tyrannus vociferans vociferans.* Cassin Kingbird. A female taken on July 15 at Laguna Valderama represents this common bird which was seen every day in the field in practically every habitat visited. The specimen perhaps shows a tendency toward *zenopterum* of Guerrero in the slightly whiter throat as compared with specimens from Durango and Arizona. The outer primaries, however, are distinctly emarginate as in *vociferans*. On July 13 at Laguna Valderama a pair of adults was observed feeding two fledglings.

**Myiarchus cinerascens cinerascens.* Ash-throated Flycatcher. The only bird of this species seen was taken in arid mesquite-prickly pear near Sain Alto on June 20. It proved to be an adult male with enlarged testes, 10 and 9 mm. long. In this specimen the tenth primary exceeds the fourth; the wing measures 102 mm. and the tail 94. The color very nearly matches that of a long series from Arizona and California, but the color is slightly darker dorsally than all but the one or two darkest specimens examined from the United States.

If more specimens from Zacatecas prove to be *cinerascens*, then the status of *Tyrannula mexicana* Kaup (1852) must be further investigated. At present the name is used for a race breeding in the Arid Tropical Zone of Sonora. The type is an unsexed, undated Wollweber specimen from "Zacatecas" (Osgood, 1907; van Rossem, 1945).

**Contopus virens placens.* Wood Pewee. An adult female (wing 81 mm.) taken on July 17 at Laguna Valderama and a male (wing 85 mm.) taken the next day at the Río Florido are best referred to this pale race, although they are certainly paler than birds of southern Arizona and northwestern Chihuahua. The species was very common at Río Florido in the willows and cottonwoods; at Laguna Valderama one or two were noted each day.

**Contopus pertinax pertinax.* Coues Flycatcher. Commonly seen and heard each day at Laguna Valderama and Hornillas. A specimen taken at Laguna Valderama, like others from southern Durango, clearly belongs to the darker southern race.

Eremophila alpestris. Horned Lark. A series of eight breeding specimens from near Sombrerete

and Laguna Valderama is intermediate between *chrysolaema* (specimens from Guanajuato, Mexico, Distrito Federal, and Puebla and *aphrasta* (specimens from Chihuahua and Durango).

**Hirundo rustica erythrogaster*. Barn Swallow. Common in Fresnillo and the city of Zacatecas and near all towns and villages in the mesquite-grassland area. At Río Florido a specimen was taken on July 18.

**Auriparus flaviceps ornatus*. Verdin. Two adult males were taken near the Río Florido on July 18. Several others were seen there on July 12 and 18 and near Sain Alto on June 20. Previously, the southernmost locality from which the Verdin was recorded was Durango City, Durango, by Ridgway (1904) and van Rossem (1930).

Turdus migratorius propinquus. Robin. Several were seen each day in the pines at Laguna Valderama and Hornillas. On July 24, 1950, one paused briefly in prickly pear and mesquite growth near Sombrerete and then flew off southward. A female, taken on July 16 at Laguna Valderama, had an egg in her oviduct. The wing length of this specimen (127 mm.) is short; the coloration is of the pale extreme of *propinquus*. Griscom (1935) has identified specimens from Zacatecas (no locality noted) as "nearer *permixtus*." The specimen from Laguna Valderama was compared with one from Michoacán (see Davis, 1953, and Lea and Edwards, 1950) and seven from Tequila, Jalisco (of the intermediate, darker type, nearer *permixtus*), as well as a long series of true *permixtus* from Guerrero, but it matched, instead, specimens from Durango (♂, wing 136 mm.; ♀, wing 127) and extreme southwestern Chihuahua (♂, wing 137 mm.) in size and pallor.

**Polioptila caerulea amoenissima*. Blue-gray Gnatcatcher. Arnold Weinberg secured a male of this species at Laguna Valderama on July 16. Several others were observed in oaks at the same place two days previously. In view of the confusion presently existing with regard to the status of the several Mexican races of *Polioptila caerulea*, the specimen from Zacatecas is tentatively placed in the race *amoenissima*. It was examined by Dr. Thomas R. Howell of the University of California at Los Angeles and found to be identical in color and markings with a male taken in June in Los Angeles County, California.

**Vireo huttoni carolinae*. Hutton Vireo. Several were seen each day at Laguna Valderama and Hornillas. Two specimens from Laguna Valderama are strikingly darker, grayer, and less green than *stephensi* from southern Arizona and northwestern Chihuahua and slightly grayer than *carolinae* from Durango. None of these specimens has any tendency toward the yellow color of *mexicanus* from Hidalgo, Guerrero, and Michoacán. For the previous southern extension of this race, which was originally described from the Chisos Mountains of Texas (Brandt, 1938), see Sutton and Pettingill (1943, Nuevo León) and Burleigh and Lowery (1942, Coahuila).

**Vireo solitarius pinicolus*. Solitary Vireo. The song of this vireo was frequently heard at Laguna Valderama and one or two were seen each day in the oaks. A male was taken on July 17.

**Peucedramus olivaceus arizonae*. Olive Warbler. Single birds were seen at Laguna Valderama on July 13, 15, and 17, and a male was taken on July 15. This specimen, like one from extreme southwestern Chihuahua in the Museum of Vertebrate Zoology (taken July 2) has the large size and lack of green of the northern race, but it is as dark (blackish) as *olivaceus* of central México (specimens examined from Michoacán, Distrito Federal, Oaxaca, and Jalisco).

**Dendroica aestiva sonorana*. Yellow Warbler. On June 20, along the Río Atotnilco, several were seen, including a female feeding a bob-tailed young Red-eyed Cowbird. An adult male was taken on this date. On July 12 and 18 several were seen, several more heard singing, and two adult males were taken in the cottonwoods and willows along the Río Florido. These specimens are clearly *sonorana* in color, but they approach *dugesi* in having the slightly heavier bill of that race. As to size, the two races are distinguished by an average difference in wing length, but there is considerable overlap. The wings of the three specimens from Zacatecas measure 63, 65, and 67 mm.

**Geothlypis trichas chryseola*. Yellow-throat. Single birds were noted in riparian growth by the Río Atotnilco on June 20, and at the Río Florido on July 12 and 18. A male taken on July 18 has the size (wing 64 mm., bill heavy) of *melanops* from central México, but it is close to the race of southeastern Arizona in color.

**Icteria virens auricollis*. Chat. Several singing males were seen in the willows and cottonwoods along the Río Atotnilco on June 20 and along the Río Florido on July 12 and 18. Three male specimens, like the one previously reported from Durango (Webster and Orr, *sup. cit.*), are even ashier

than the extreme grayest specimens from southern Arizona. Measurements, however, are similar to those of *auricollis* from the western United States.

**Setophaga picta picta*. Painted Redstart. Several were seen each day at Laguna Valderama. On July 17, for instance, Webster watched a closely bunched flock of five adult males working through the oaks. A female was taken on July 16.

**Sturnella magna auropectoralis*. Meadowlark. Common in all sections visited in 1952, except in the pines above Laguna Valderama and near Hornillas. Specimens were taken on June 21 at Cerro Gordo and on July 16 at Laguna Valderama, both in full breeding condition. Saunders (1934) in the original description of this race lists specimens from neither Zacatecas nor Durango, although he does list them from several surrounding states.

**Piranga flava hepatica*. Hepatic Tanager. Several were seen each day at Laguna Valderama. A streaked juvenile was taken on July 13 and an adult female the following day. These specimens are indistinguishable from those examined from southern Arizona.

**Pheucticus melanocephalus melanocephalus*. Black-headed Grosbeak. A singing male was taken on July 14, 1950, in the oaks at 9700 feet on Cerro Pachon and several others were seen that day. In 1952 one was seen on June 18 in the junipers at Cerro Gordo, and one or two were noted each day at Laguna Valderama.

Carpodacus mexicanus. House Finch. This species was common at Cerro Gordo, Río Atotnilco, Río Florido, and Laguna Valderama. Webster and Orr (1952) recorded a male from Sombrerete as intermediate among three races. With the addition of three more males taken at Cerro Gordo and with considerably more comparative material of other races available, it appears that the series taken in Zacatecas now nearly approaches *coccineus*. The four birds are definitely *coccineus* in color and pattern, but they tend somewhat toward *potosinus* and/or *centralis* in larger size (wing 80 to 83 mm., average 81.5 mm.; tail 62 to 66 mm., average 64.5 mm.) than topotypical *coccineus*. Two males in the Museum of Vertebrate Zoology were taken May 28, 1940, at Lulu, in extreme northeastern Zacatecas. They are clearly of the race *potosinus*, the adult being dull red rather than the brilliant scarlet red of *coccineus* from Cerro Gordo and Sombrerete.

**Oriturus superciliosus*. Striped Sparrow. One to three were seen each day at Laguna Valderama, and two adults were taken. On July 13 Edwards and Russell saw several in the pines between Milpillas and Hornillas.

**Ammodramus savannarum bimaculatus*. Grasshopper Sparrow. In several areas of the dry "Laguna" at Laguna Valderama there was bunch grass nearly a foot high, and here many Grasshopper Sparrows were heard singing on July 15, 16, and 17. Five males in full breeding condition (wing 63 to 65 mm., average 63.8 mm.) and one female with a brood patch (wing 59 mm.) were taken. As to color, this series is very different from *pratensis* of the eastern United States and Canada (buffiier laterally) and from *ammolegus* of southeastern Arizona (paler, less rufescent dorsally). Specimens from Zacatecas can be distinguished from those representing the *pratensis* x *perpallidus* populations of Kansas and Texas by the paler, more buffy color on the sides of the head and neck and the paler breast. They differ from specimens of *perpallidus* from California and Nevada in somewhat darker, more blackish upper parts and slightly longer wing.

**Chondestes grammacus strigatus*. Lark Sparrow. Several were seen each day in the sparse junipers at Cerro Gordo, and males in full breeding condition were taken on June 18 and 19. On July 12, 13, and 17 a few were seen in oak-savannah country just northeast and just west of Laguna Valderama.

**Aimophila ruficeps simulans*. Rufous-crowned Sparrow. Common and apparently breeding in the mesquite-prickly pear association near Sombrerete, July 13 to 24, 1950. Males were taken on July 13 and 16. Not seen in 1952. Ridgway (1901) listed the race *fusca* from central and southern Zacatecas. These two birds, however, are whiter ventrally and less rusty dorsally than *fusca* from Jalisco and Michoacán, but they are larger (wing 68, 69 mm., tail 72, 69 mm.) than either *fusca* or *simulans*, the latter from Durango and Sinaloa.

**Amphispiza bilineata grisea*. Desert Sparrow. A very common species in the arid mesquite-prickly pear association near Sain Alto on June 20 and about Río Florido and Fresnillo on July 11, 12, and 18. Two singing males were taken at Sain Alto.

**Spizella passerina mexicana*. Chipping Sparrow. Very common in the junipers at Cerro Gordo and in the pines about Laguna Valderama and Hornillas. The three specimens taken seem best re-

ferred to the southern race, but this does not imply nonrecognition of the race *atremaeus* described by Moore (1937).

**Spizella wortheni*. Worthen Sparrow. On the morning of June 19 the senior author located an unfamiliar species a half mile south of the camp at Cerro Gordo. The spot was a grassy, nearly level pasture dotted sparsely with low mesquites and small junipers. The male was singing continually from a waist-high mesquite and the female was in close attendance. Both birds consistently returned to this bush after they were disturbed, but no nest could be found. The song suggested a cross between the song of an Eastern Field Sparrow (*S. p. pusilla*) and that of a Chipping Sparrow (*S. passerina*), for there was a slurred-down note followed by a trill on a higher pitch with no intermediate notes or gradual *accelerando*. Both birds were collected after another singing male was noted.

Two days later, on June 21, a return to this area resulted in the discovery of three singing males, at least one of which was accompanied by a female. The songs of all three were rather similar to the one described previously, except that one bird pitched his initial (Field Sparrow-like) slurred note higher than the subsequent (Chipping Sparrow-like) trill. One male was collected.

All three specimens are in an early stage of the "postnuptial" molt, which has progressed from the mouth posteriorly to varying points on the head. This makes comparison with existing specimens of Worthen Sparrows rather difficult, since most of them exhibit varying degrees of wear of the plumage. Nonetheless, it is clear that this extension of the known breeding range to western México involves sufficient difference in coloration to warrant nomenclatural recognition.

Spizella wortheni browni new subspecies

Type.—Adult male, no. 61596 California Academy of Sciences, taken near Cerro Gordo, 9½ miles northwest of Sombrerete, 8000 feet, Zacatecas, México, on June 19, 1952, by J. Dan Webster; original no. 1040.

Diagnosis.—Considerably darker above than *Spizella wortheni wortheni*; fresh plumage on crown of males nearest Mars Brown of Ridgway (1912) rather than Cinnamon-Brown; back and scapulars more buffy (less grayish) than *S. w. wortheni*; rectrices of specimens examined, although decidedly worn, much darker than those of *S. w. wortheni* in comparable plumage.

Range.—Known only from the type locality in western Zacatecas.

Specimens examined.—*S. w. browni*, 3: 9½ miles NW Sombrerete, 8000 ft., Zacatecas (Calif. Acad. Sci.), 2 ♂♂, 1 ♀. *S. w. wortheni*, 13: Silver City, New Mexico (U. S. Nat Mus.), 1 ♂ (type); Miquihuana, Tamaulipas, 7 (Calif. Acad. Sci., 1 ♂, U.S. Nat. Mus., 4 ♂♂, 1 ♀; Mus. Vert. Zool., 1 ♂); Salinas, San Luis Potosí (La. State Univ. Mus. Zool.), 2 ♀♀; Tepetate, San Luis Potosí (La. State Univ. Mus. Zool.), 1 sex?; Saltillo, 5500 ft., Coahuila (La. State Univ. Mus. Zool.), 1 ♂; Chalchicomula, Puebla (U.S. Nat. Mus.), 1 ♂.

The new race is named in honor of the late Wilmot W. Brown, who collected so much of the valuable material of Mexican birds now in several museums, including a majority of the above-listed specimens of *S. w. wortheni*.

Remarks.—The existence of a breeding population of *Spizella wortheni* in Zacatecas marks a considerable extension of the range of this little known species in México.

In view of the conclusions reached earlier by Burleigh and Lowery (1942) regarding conspecificity of *Spizella wortheni* and *S. pusilla*, careful consideration was given to this question. In brief, after examining a large series of *S. pusilla* (including both *pusilla* and *arenacea*) and the sixteen specimens of *S. wortheni* (including the type) previously listed, we are forced to disagree with these authors. It is true that, as Burleigh and Lowery have indicated, these two species are extremely close in measurements and certain of the characters used by Ridgway (1901) to separate them fail to do so. A white eye ring is clearly evident in some examples of *pusilla*. A brown postocular patch is distinctly present in the specimen of *wortheni* from Coahuila in the Louisiana State University Museum of Zoology and it is felt that this specimen may have influenced Burleigh and Lowery. Furthermore, the specimen from Coahuila is so much darker (more reddish) than any other examples of *wortheni* that it will likely prove to belong to a distinct race of this species when further material is secured. However, the very distinct wing

bands and rusty brown color of the back and scapulars in *pusilla* are not duplicated in any specimens of *wortheni* examined. The difference in song between these two kinds of sparrow, as noted by one of us in the field, further confirms our present views. We do not wish to preclude the possibility that intergradation may occur but our feeling is that it cannot be satisfactorily demonstrated at present.

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Hanover College, Hanover, Indiana, and the California Academy of Sciences, San Francisco, California, and the University of San Francisco, January 19, 1954.

FROM FIELD AND STUDY

Nesting of the Laughing Falcon.—Sheffler and van Rossem (Auk, 61, 1944:141) gave an account of the nesting habits and a description of the eggs and young of the Laughing Falcon (*Herpetotheres cachinnans*). Although these authors must be complimented for presenting information not previously recorded concerning the nesting habits and the young, their description of the eggs of this species is erroneous. A careful reading of their record of the two supposed nests of this species from which the eggs were taken indicates that in both instances they had been directed to a nest by a local boy and that they did not actually see a parent bird leave either nest. At one place a male was shot and a female was seen near a nest and at the other a pair of birds was seen near where a nest was found. Consequently the identity of the eggs was largely a matter of assumption, although it was a logical supposition because a female had been taken as she left a similar nest in which young were found.

Their description of the eggs was questioned in personal correspondence with the senior author shortly after the article was published but no correction has ever been made. At that time the wrong identification of the eggs was suspected because the measurements given were: "44.2×37.6 and 43.5×37.7 mm." These appeared altogether too small to represent the eggs of a bird as large as the Laughing Falcon. In addition their remarks that "the eggs . . . resemble those of an owl. . . . pure white, and rather smooth in shell texture," obviously applied to the eggs of some species of owl and were entirely different from any known eggs of any species of the Falconiformes. Moreover in 1935 I received from a collector in Paraguay the skin of a female of the southern race, *Herpetotheres cachinnans queribundus*, together with an egg which was alleged to have been taken from the nest where the female was shot. This egg measures 56.5×45.6 mm. which is considerably larger than the measurements given by Sheffler and van Rossem. The egg is fairly well smeared over the larger part with rich reddish chestnut, and splashes of light red are scattered over the remainder. The shell where visible is white, rather rough grained, and entirely devoid of any gloss. Of course the identity of this egg can be questioned but it certainly is about the size and more the color of an egg to be expected from this species.

On the morning of March 28, 1953, while on a collecting trip in Mexico, I flushed a Laughing Falcon from a natural cavity in a huge cypress growing on the edge of the Sabinas River about 25 miles northwest of Mante, Tamaulipas. The opening was some 40 feet from the ground and the cavity was about two feet in diameter, extending down 30 inches. The bottom of the cavity was covered with a miscellaneous assortment of droppings, decayed wood and other debris with some old leaves but no other nesting material. Although it looked as though it had long been used as a nesting cavity, there was nothing in it. In the late afternoon we went back to this tree and the falcon again flushed from the cavity but it was not again inspected. On April 3, 1953, we returned to this nest in the hope of finding eggs but the previous day there had been heavy rain and the river was too high to attempt to get to the tree. At that time the falcons were neither seen nor heard.

About five miles down the river from this nest a native boy told us that he knew of the nest of a "Vaquero," the local name for the Laughing Falcon. He took us to another huge cypress. The top of this tree had been broken off about 60 feet from the ground and apparently there was a large depression in the top of the stub. No Laughing Falcons were seen in this vicinity and we were unable to flush anything from the top of the stub, but both the boy and a farmer who lived near assured us that several times they had seen a "Vaquero" go in and come out of the top of the stub. An attempt was made to climb to the top for an inspection, but the first limb was about 40 feet from the ground, and although the climb was not impossible with the aid of ropes, it was finally given up because the stub was heavily infested with large, black, vicious ants.

Although I was not successful in finding a nest with eggs, on April 16, 1953, Dr. T. C. Meitzen and Joe Johnson of Refugio, Texas, took an egg of the Laughing Falcon (*Herpetotheres cachinnans chapmani*) which they have presented to me. This was found about 12 miles north of Valles, San Luis Potosí. Dr. Meitzen's account of this is quoted : "Nest in a natural cavity about 12 inches in diameter and three inches deep, comparatively open from above and situated in the crotch where three large limbs had forked from the main trunk, about 35 feet from the ground. The nesting cavity contained no special lining other than the usual accumulation of debris. The nesting tree grew on a steep, rocky

hillside sloping into a dry arroyo and was in a rather open situation where only a few other trees were growing. The nesting site was first located April 13, 1953, when it held one fresh egg. The male was shot and crippled but was not secured. When the shot was fired the female flushed from the hollow, circled a few times and lit in the nesting tree. She was also shot at but apparently missed. On April 16 we returned to the nest and found it deserted but the egg was taken." This egg, shown on the accompanying plate, measures 58.0×44.6 mm. The ground color is entirely concealed with a thick

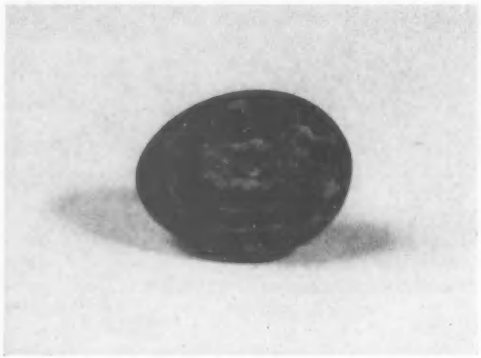

Fig. 1. Egg of *Herpetotheres cachinnans chapmani*, taken near Valles, San Luis Potosí, México, April 16, 1953.

wash of dark chocolate brown and a few splashes of burnt umber, but there are a few streaks of lighter yellowish brown where the pigment is thinner and appears to have been rubbed off when the shell was wet. In general appearance it can be matched with some types of eggs of the Caracara (*Caracara cheriway*).

Sheffler and van Rossem raise the question of the choice of nesting sites and the type of nest construction employed by this species in forested areas where cliffs are nonexistent. This question is answered by the two nesting sites in trees here described and by the nest from which Dr. Meitzen took an egg. It is well known that occasionally the Peregrine Falcon (*Falco peregrinus*), which is normally a cliff nester, will use a natural cavity in a tree when cliffs are not available. Likewise the Sparrow Hawk (*Falco sparverius*) normally uses a natural cavity but will occasionally resort to a nest in a cliff if no tree cavities are available. In view of this adaptability to different nesting sites in allied species and the presently available information, it can now be assumed that the Laughing Falcon may nest either in a hole in a cliff or in a natural cavity of a tree, and that no nesting material is added in either case. I think that the use of a natural cavity in a tree constitutes the normal nesting site and that the use of a hole in a cliff would be an unusual occurrence. This is based on the fact that this species is resident and breeds over a greater part of its range where no suitable cliffs are available, but where natural cavities in trees are more or less common.—Col. L. R. Wolfe, *Kerrville, Texas, December 28, 1953.*

Body Temperatures of Botulistic Pintails.—An experiment to determine the effects of botulism on the body temperature of the Pintail (*Anas acuta*) was conducted at Tule Lake National Wildlife Refuge, California, during the months of August and September, 1952. The data for this experiment were obtained from temperatures taken before treatment and after recovery of 118 pintail ducks suffering from botulism (*Clostridium botulinum* type C). A five and one-half inch, rapid-recording, binoc, etched-stem Taylor thermometer no. 21418 was inserted approximately two inches into the cloaca for a period of about two minutes to obtain the body temperature. The birds were sexed, aged, and after treatment with antitoxin and fresh water, marked with colored leg bands and placed in holding pens until they had recovered or succumbed.

The results of this work, as shown in the table, indicate a markedly lower temperature in the birds affected by botulism. The mean temperature for the pintails before treatment was 101.8 degrees Fahrenheit and after recovery it was 106.6. Observations indicated that as the severity of the infection

A Comparison of Body Temperatures of Botulistic Pintail Ducks before Treatment and after Recovery

Group	Number	Mortality	Before treatment Mean temp. (°F.)	After recovery Mean temp. (°F.)
Adult	46	8	102.3	106.9
Immature	72	16	101.6	106.4
	118	24		
Male	69	10	101.8	106.6
Female	49	14	102.0	106.5
	118	24		

increased, as determined by the external physical condition of the bird, there was an accompanying decrease in the body temperature. This relationship seemed to be substantiated when it was found that there were only three recoveries in the ten cases in which the body temperatures had fallen below 100 degrees plus the fact that the pintails most seriously affected had the lowest temperatures.—C. V. Oglesby, *Nevada Game Commission, Reno, Nevada,* and Fred A. Glover, *United States Fish and Wildlife Service, Patuxent Research Refuge, Laurel, Maryland, November 15, 1953.*

The Gray-cheeked Thrush at Point Barrow, Alaska.—Bailey (Colorado Mus. Nat. Hist., Pop. Ser., 8, 1948:279-280) reported that the Gray-cheeked Thrush (*Hylocichla minima minima*) is very common throughout the Kotzebue Sound region of Alaska and inland among willows in the foothills bordering the arctic slope. Its normal breeding range extends along these foothills to the delta of the Mackenzie River, thence southeasterly to the Anderson River region and northern Newfoundland. However, he is able to list four vagrants to the northward as far as Point Barrow on June 8 and 10, August 29, and September 19. A fifth specimen can now be reported from Point Barrow. On September 19, 1952, I found a dead bird on the ground directly under the radar target located on the edge of the low bluff that constitutes the northernmost tip of Alaska. The bird apparently had flown into the heavy woven wire grid of the target's vanes. A ragged wound found along the throat and a hemorrhagic area over the top of the skull indicated the violence with which the bird struck the screen. The specimen was a male, weighed 25.23 grams, and the gonads were 1.5 and 2 mm. long.

Bent (Bull. U. S. Nat. Mus. Bull. No. 196, 1949:199) gives September 8 and 9 as late dates for departure of the Gray-cheeked Thrush from Nome and St. Paul Island, respectively. It is reasonably certain that my specimen from Point Barrow had lingered in the arctic considerably past the dates quoted by Bent, for although the bird was cold when picked up, there had been no appreciable desiccation of the tissues and it could scarcely have been dead more than twenty-four hours.

The recently collected specimen is now No. SU 12159 in the Zoological Collections of the Natural History Museum at Stanford University.—Ira L. Wiggins, *Natural History Museum, Stanford University, California, March 23, 1953.*

Scott Oriole Wintering at Palm Springs, California.—On December 30, 1953, a male Scott Oriole (*Icterus parisorum*) was seen by me in Palm Canyon near Palm Springs, Riverside County, California. This bird, in fine male plumage, was observed through 8-power glasses, although at times he was so close that these were unnecessary. A search of the literature reveals very few instances of wintering birds of this species in California.—Earle R. Greene, *Los Angeles, California, January 1, 1954.*

Leaf Bathing of the Mockingbird.—While at breakfast on November 28, 1953, I was amused and very much surprised by the antics of a Mockingbird (*Mimus polyglottos*) in an avocado tree

outside my window. At first I could not decide what the bird was doing. After I had watched it for five minutes, however, I noticed that it was getting wet, its tail was already hanging heavy and its body feathers were soaked. It finally occurred to me that the bird was actually taking a bath. It was now 7 a.m. and the morning was cold; the sun was up just enough to shine on the top of the avocado. There had been a heavy dew in the night, and drops of water glistened on the leaves of the tree.

The bird would alight on the end of a branch where the new growth evidently held more moisture, then rub its head from side to side on the leaves, at the same time fluttering its wings in regular bird-bathing fashion. This would end with a great flapping of wings as the bird fell—indeed crashed—down through the leaves for several feet. When falling in this manner, the Mockingbird was showered with a mass of water droplets. It would check its fall about halfway down the tree and either fly back to a higher branch or sometimes to another tree fifty feet away and go through the same performance again. I watched the bird for twelve minutes as it repeated this over and over until it was well soaked. It then perched on a topmost branch and finished its bath with a series of fast shakes, flutters, and preening.

While I was watching this activity, my wife noticed in a tree in the backyard another Mockingbird which evidently had just finished its bath as it was very wet and was drying itself. Presumably its procedure had been similar to that of the first bird. So far as I know there was no water near by.

In my many years of bird study I have never seen or read of this peculiar yet natural way of bathing. Even so, I suspect that leaf bathing is of fairly frequent occurrence but has somehow escaped general notice.—WALDO G. ABBOTT, *Santa Barbara, California, January 1, 1954.*

Association and Seasonal Succession in the Use of Nest Sites.—In the vicinity of their nests passerine birds exhibit varying degrees of tolerance of the presence of other species. In general, however, two species do not place their nests close together, especially if they use the same type of nest site.

In several areas near Ann Arbor, Michigan, I have been impressed by the fact that three species of birds build their nests in the same type of vegetation, although at different times in the nesting season. These three species are: Traill or Alder Flycatcher (*Empidonax traillii*), Yellow Warbler (*Dendroica petechia*), and American Goldfinch (*Spinus tristis*). The data presented here were obtained during the breeding seasons from 1947 through 1953. Four of the five areas mainly concerned in this report are located in Ann Arbor Township, Washtenaw County: (1) University Botanical Gardens in Ann Arbor (Section 33); (2) Blanchard's Pond (Section 31); (3) Geddes Pond (Section 27); (4) Hogback Road area (Section 36; for a photograph of part of this habitat see Berger and Parmelee, Wilson Bull., 64, 1952:35); (5) near Dixboro, Michigan (Section 20, Superior Township).

There is, of course, some overlap in the breeding seasons of these species, but the main nesting period for each is different from that of the other two species. Much of the overlap that does occur is probably due to re-nesting after failure of a first nest. So far as is known the Yellow Warbler and the Traill Flycatcher are single-brooded in southern Michigan. Some American Goldfinches have two broods.

Nest building by the Yellow Warbler begins in the first or second week of May (May 10, 1951, May 11, 1949, and a nest with one egg on May 11, 1952). I have never seen an active nest later than the first week of July.

The Traill Flycatcher starts to build in the first week of June (June 2, 1950, and 1953, June 4, 1951), and eggs have been found on June 7 (1951 and 1953) and June 9 (1952). The earliest dates I have known young to fledge were July 4 (1951), and July 6 (1952 and 1953). The latest dates for nestlings were August 16 (estimated date of fledging, August 19, 1948; see Berger and Hofslund, Jack-Pine Warbler, 28, 1950:10) and August 19 (1951). I have some evidence to indicate that this species does not attempt to re-nest if a nest is destroyed after the third week of July.

Although I found a goldfinch nest with one egg on June 12, 1947 (Berger, Wilson Bull., 60, 1948: 52-53), in subsequent years this species has begun nest construction in the first or second week of July. Nestlings have been observed each year as late as the third or fourth week of September.

Depending on the area concerned, the following vegetation has most often been used as nest sites: ninebark (*Physocarpus opulifolius*), panicled dogwood (*Cornus racemosa*), hawthorn (*Crataegus* sp.), and privet (*Ligustrum vulgare*). It is interesting to note that in the Ann Arbor region red-osier dogwood (*Cornus stolonifera*) is rarely used for nest sites by any of these species. Nickell (Auk, 68, 1951:

455), however, found that 10 per cent of 243 goldfinch nests were built in *Cornus stolonifera* in southern Michigan, and Stokes (Wilson Bull., 62, 1950:118) found goldfinch nests "commonly placed in red-osier dogwood" in Wisconsin.

The same bush has been used as a nest site by one or all three of the species in successive years. In several instances, in a single summer, either two or three of the species discussed here have built in the same clump or thicket or in nearby bushes.

One especially interesting example of nest site association, in panicled dogwood, was observed at Geddes Pond in 1952. On June 10, I found a Yellow Warbler nest with three young estimated to be four or five days old; a Traill Flycatcher nest was under construction in the same clump of dogwood 53 inches from the warbler nest. Three young flycatchers hatched on July 3 or 4. An American Goldfinch nest, begun about August 15, was placed 40 inches from the Traill Flycatcher nest and 23 inches from the Yellow Warbler nest. In 1953 both Yellow Warblers and Traill Flycatchers nested again in this same clump of dogwood. I did not visit the area until July 7, 1953, at which time the one remaining flycatcher flew from the nest at my approach; the warbler nest had been empty for some time.

At the University Botanical Gardens, two young flycatchers left their nest in a privet hedge on July 30, 1953. On August 20, I first noted a complete, empty goldfinch nest, in the same hedge, 40 inches from the flycatcher nest. Five goldfinches hatched on or about September 5.—ANDREW J. BERGER, *Department of Anatomy, University of Michigan Medical School, Ann Arbor, Michigan, September 10, 1953.*

The White-winged Crossbill in the Cascade Mountains of Oregon.—On September 17, 1953, while preparing some specimens of Red Crossbills, Mr. Ed Parker, a local forest Ranger, asked me how old a crossbill had to be "before they developed white markings on their wings." On questioning Mr. Parker he told me that since late August of that year a flock of crossbills "with white patches on their wings" had been seen at Big Cultus Lake, altitude 4668 feet, in the Deschutes National Forest. On September 19, 1953, Mr. Parker guided me to the exact spot where he had observed these birds. As our boat landed on the lake shore, an adult White-winged Crossbill (*Loxia leucoptera*) was seen among the rocks beside an old campfire site. Between 4 and 5 p.m., we saw five more individuals. An adult male, a female and one immature were taken; the sex of the latter could not be determined.

To the best of my knowledge this species has not before been taken in the Cascade Mountains south of Mt. Rainier, Washington, and only once in the Wallowa Mountains (Miller, Condor, 40, 1938:226) of extreme northeastern Oregon.—STANLEY G. JEWETT, *Portland, Oregon, October 3, 1953.*

Yellow-headed Vulture in Tamaulipas, México.—Inspired by Wetmore's interesting and clarifying paper (Jour. Wash. Acad. Sci., 40, 1950:415-417) on the Yellow-headed Vulture (*Cathartes burrovianus*), and Heermann's (Dresser, Ibis, 1865:322-323) sight record of this species in the Brownsville region of Texas, presumably in 1864, we decided to look carefully for it during our visit to the Tamaulipas coast in the summer of 1953.

We had been in México only three days, but had trained our binoculars on several scores of Turkey Vultures (*Cathartes aura*) in the Tampico region before identifying the smaller yellow-headed species. On June 19 one was seen flying over sand dunes along the Gulf, east of Loma del Real. On June 23, we saw two birds perched together on fence posts along the Mante-Tampico highway 6½ miles south of Altamira. We did not identify a Yellow-headed Vulture again with certainty until July 20, when we saw two flying over the field at the Tampico airport.

On July 21, we obtained a specimen. A vulture that we identified as this species alighted on a fence post in the open, marshy *Spartina* flats, 8 miles north of Tampico and about a mile inland from the Gulf. As we approached it, a Turkey Vulture soared close and actually flew at the Yellow-headed Vulture, driving it from its perch and settling there itself—this in spite of the fact that there were many similar perches to either side. Fortunately the *burrovianus* alighted again only a few posts away. The larger *aura* showed definite signs of anxiety. Twice as we neared it, it made false starts, spreading its wings as though to fly, while the Yellow-headed Vulture seemed undisturbed by our presence, although we were actually closer to it. Blake (Birds of Mexico, 1953:64) called attention to this apparent tameness of the Yellow-headed Vulture. Having individuals of the two species so close together, we had excellent opportunity to compare them and were struck especially by the marked differences

in size and head coloration. These differences were apparent at well over a hundred yards with the aid of binoculars.

The specimen was a male with unenlarged testes (7×2.5 millimeters). We made color notes on the fleshy parts of the freshly killed bird, as follows: bill, ivory; irides, blood red; dorsal skin of head from cere to eyes, rose; skin of crown, bright blue in center, narrowly edged with light green; skin around eyes, chin, back of head and nape (to the feathers), yellowish orange; tarsi and feet, dark gray, with white depressions between the scales, giving an overall effect of light, ashy gray. The bird was not fat, but, unfortunately, we had no way of determining the weight. Its stomach contained part of a frog (possibly *Rana pipiens*) which appeared to be fresh.

The bird was undergoing a regular, bilateral molt, involving both body and flight feathers. The outermost two primaries were old and somewhat worn, the next two were still sheathed, and the inner primaries were fresh and of full length. The lateral pair of rectrices and two middle pairs were in molt. One of the latter was apparently full grown and no longer sheathed at the base. The specimen measured: wing chord, 442 mm. (note molt of primaries); tail, 208; and culmen from cere, 21.

Cathartes burrovianus apparently has not been recorded in the state of Tamaulipas heretofore. We did not record it north of Loma del Real, but we spent relatively little time in the more northern parts of the coastal area.

We will probably never know whether the "Mexican Vultures" which Dresser (*loc. cit.*) mentioned were actually *burrovianus* or not, but the possibility of that species occurring in the lower Rio Grande valley now seems slightly less remote to us. Although the Yellow-headed Vulture is fairly readily identifiable in the field, there is enough chance for error to demand that additional northern records be based on collected specimens. In view of Dr. Wetmore's remarks (*op. cit.*) on size variation within the species, collection of additional specimens from the north is warranted in any case.

The specimen we collected is now in the collection of George M. Sutton of the University of Oklahoma.—Richard R. Graber and Jean W. Graber, *Department of Zoology, University of Oklahoma, December 15, 1953.*

Notes from Panamá and the Canal Zone.—In the course of a year's residence in the Panama Canal Zone, from June, 1950, to June, 1951, several species of birds were seen whose occurrence in this area seems to be noteworthy.

Aythya collaris. Ring-necked Duck. On February 25, 1951, while scanning the lake formed by damming of the Caimito River, just east of Red Tank, Canal Zone, a group of 12 diving ducks was spotted with 10×50 and 7×50 binoculars at about three hundred yards' distance. One adult, full-plumaged male Ring-neck was easily identified in the group, showing the black back and white mark in front of the wing very well. The bird was also observed with a 40x telescope in excellent light. The group flew while we were observing them, incidentally showing the gray wing stripe and black back of the male bird, and our impression is that at least the majority of the duller birds were females or immatures of this species. Lesser Scaups (*Aythya affinis*) had been observed by us on the same lake, and the possibility of females of that species being among the group must be entertained in the absence of positive identification. However, the identity of the lone male is beyond all doubt. This record represents a southern extension, from Guatemala, of the known wintering range of this species.

Buteo jamaicensis. Red-tailed Hawk. On December 23, 1951, while hiking on the Chiva Chiva trail, on the Pacific slope of the Canal Zone, a large buteonine hawk with characteristic rusty-red upper tail surface was observed at about five hundred yards' distance. The upper view was unmistakable as the bird cruised and wheeled slowly a few hundred feet off the ground. A resident subspecies (*costaricensis*) breeds as far south as the mountains of western Panamá, but Griscom in his Panamá check-list (Bull. Mus. Comp. Zool., 78, 1935:261-382) does not record it beyond Veraguas. It is uncertain whether our bird was a wanderer of this race or a representative of one of the migratory northern subspecies.

Larus pipixcan. Franklin Gull. On June 2, 1951, at Gatun locks in the Canal Zone, a flock of approximately fifty individuals of this species was noted, wheeling at low heights (50 to 100 feet) over the area. Plumages varied from nondescript immature to full adult, with the distinctive broad white band separating the black wing tips from the gray of the remainder of the wing as a prominent mark. There is a possibility that the flock was mixed with Laughing Gulls (*L. atricilla*), but all

of the many individuals examined were this bird, and it seems relatively certain that other species would have been picked out in the course of five or more minutes of observation. Published records for Panamá seem rare (Griscom, *op. cit.*), probably due to inadequate coverage (see Eisenmann, Smithsonian Misc. Coll. 117, 1952:20).

Sphyrapicus varius. Yellow-bellied Sapsucker. On December 17, 1950, at Summit Gardens, Canal Zone, one individual was observed at a few paces with binoculars. The head and wing pattern was unmistakable, although the individual was in immature or female plumage. Only one record for Panamá (from Chiriquí, in western Panamá), is noted by Griscom (*op. cit.*).

Bombycilla cedrorum. Cedar Waxwing. On five occasions individuals and flocks of this species were noted on the Pacific side of the Canal Zone. The observations were as follows: a single individual near Farfan Beach on January 14, 1951; several near Chorrera on January 20, 1951; in Ancon on January 25, 1951, and February 3, 1951; and a flock of about fifteen birds near Camp Empire on March 4, 1951. Griscom recorded one collected specimen, from "Chiriquí" in western Panamá.

Sicalis luteola. Yellow-breasted Grass-finch. Yellowish finches, which we could not at the time identify, were noted on the roadside at two localities between Río Hato and Penonomé, province of Coclé, Panamá, on January 28, 1951. Identification of this species in Panamá was first made on July 3, 1952, by Mr. Eugene Eisenmann, who then found colonies that were apparently breeding at various places along the same highway in Coclé; specimens collected in this area by Alexander Wetmore in May and June, 1953, confirmed the identification (E. Eisenmann *in litt.*). Our observation of January, indicating that the birds remain in the same area during the dry season (though presumably breeding in the rainy season), makes it the more remarkable that the species should hitherto have been unrecorded between Guatemala and Colombia.

Sicalis flaveola. Saffron Finch. A pair was noted in front of the clubhouse at Gatun, Canal Zone. on June 3, 1951, and two recognizable photographs were taken. A check of specimens at the University of Michigan Museum of Zoology confirmed the identification tentatively advanced by Mr. Eisenmann on the basis of the color slides. Last word from Mr. Eisenmann (*in litt.*) indicates that he saw at least two birds of this species in the same area on July 10, 1953. This colorful and widespread South American species has never been reported from continental Middle America. Although the individuals seen acted like wild birds, the possibility exists that they were formerly caged. The continued presence of this species in Gatun from 1951 to 1953 suggests that the species may have become established and indicates the desirability of investigation as to its status.—Robert T. Scholes and Kathryn T. Scholes, *Bushnell, Illinois, October 16, 1953.*

Black-necked Stilt (*Himantopus mexicanus*) on its nest. Photograph taken June 18, 1947, at Los Angeles, California, by Don Bleitz. The nest contained four eggs and was situated at a pond near 170th Street and Vermont Avenue.

NOTES AND NEWS

Junea W. Kelly

The friends and students of Junea W. Kelly present in this issue of The Condor the Grayson painting of the little known neotropical cotinga, the Polymorphic Attila (*Attila spadiceus*). This is done in warm appreciation of Mrs. Kelly's more than 30 years of teaching in the extension division of the University of California. Her field courses in bird study and natural history have brought to an extraordinarily large number of people pleasure and vivid enthusiasm in the knowledge of birds and recreation of a most valuable kind. Mrs. Kelly is a past president of the Northern Division of the Cooper Ornithological Society and has served the Society on the Council of the American Ornithologists' Union. At present she is representing the Cooper Society at the Eleventh International Ornithological Congress in Switzerland.—A.H.M.

Grayson's painting of *Attila spadiceus* was made in June of 1862 and was based on specimens he took on the Río Mazatlán, Sinaloa, México. The extremely yellow bird in the figure is apparently the yellow variant of the species referred to by Ridgway (Birds N. M. Amer., pt. 4, 1907:809, footnote) among Grayson's original specimens of the race "*cinnamomeus* Lawrence," which is now known as *A. s. pacificus* Hellmayr.

PUBLICATIONS REVIEWED

BIRDS OF WASHINGTON STATE. By Stanley G. Jewett, Walter P. Taylor, William T. Shaw, and John W. Aldrich. University of Washington Press, Seattle, xxxiv + 768 pp., 12 color pls., 99 black and white pls., 51 range maps, 1 life-zone map. 1953 (November 16); $8.00.

This comprehensive treatment of the birds of the state of Washington has been in the developmental stage for over thirty years, primarily as a project of the United States Biological Survey and its successor, the Fish and Wildlife Service. In 1917 Taylor and Shaw began assembling data based on their own field work but were not able to complete the task because of other duties and assignments. In the last ten years of the project, the leading worker involved in field investigations and compilation of distributional material has been the veteran ornithologist of the Pacific Northwest, Stanley G. Jewett. The classification has been the work of Aldrich.

The general introductory sections of the book treat such topics as history, topography, climate, zonation, refuges, and introduction of species. These statements although at some points a little loose or oversimplified are generally sound and reflect the intimate knowledge of the area on the part of the senior authors. The approach is descriptive; there is no faunal or ecologic analysis as such. The bibliography is apparently fairly complete up to 1945 but is limited in entries after that date and there is little or nothing after 1951.

The main purposes of the book are accomplished in the species and subspecies accounts which undertake to provide: (1) a guide, by means of descriptions, for the recognition of birds; (2) synoptic data on nesting, with specific examples for the state; (3) indication of distribution, migration, and seasonal and habitat occurrences; (4) miscellaneous commentary on natural history drawn chiefly from the literature for the state and the notes of the authors and collaborators; and (5) a complete list and current classification of races and species for the area.

Some commentary is on order on how certain of these aims are carried out. The descriptions of birds are in most instances direct and acknowledged quotations from Bailey's Handbook of Western Birds or, with respect to young, from

Bent's Life Histories. Dimensions are rather loosely given in inches. Nicely supplementing the descriptions is a good series of photographs, well reproduced, which represents one of the strongest features of the book. The photographs are by a number of able wildlife photographs such as Finley, Congdon, Kenyon, Alex Walker, and Yocom.

The accounts of distribution in the state are given for each kind both in general terms under "status" and in stereotyped formulations which specify limits, around the compass, and cite particular stations. A very helpful and necessary gazetteer is provided at the end of the work. The striking life-zone map is also useful in this regard; it has one unfortunate error, however, in the legends for the timbered and untimbered divisions of the arid transition zone, which are reversed. The 51 range maps show by shading the ranges of geographically variable species in the state; no individual plotting of critical specimens is entered on them.

The vernacular nomenclature is well worked out to show species units through general correspondence with the names tentatively devised by the A.O.U. Check-list Committee for its forthcoming 5th edition of the North American Check-list. On the other hand, the scientific nomenclature for species and subspecies employed by Aldrich is at variance with the views of many other workers on numerous points; this in turn of course complicates the parallel vernacular names. Any person has a right freely to take issue with the check-list committee or any other group. Also it should be realized that no two workers dealing with the difficult decisions entailed in the application of subspecies names can be expected to see eye to eye on all issues. However, it is particularly important for the amateur and beginner using this book to realize that Aldrich has approached the subspecies problem in a way quite unacceptable to a number of other taxonomists; he has in many instances recognized racial subdivisions considered by others as far too trivial and inconsistent and not conforming to the 75 per cent rule of differentiation and has credited to the state certain subspecies based on questionable determinations of what may be chance variants of other racial populations. This is the type of approach to the subspecies problem that has often brought the employment of trinomials into poor favor with biologists in other fields.

In short, the last word on subspecific classification has not yet been offered for the state of Washington and actually, as Aldrich himself indicates, many ranges of races are not yet sufficiently documented by specimens. Neither in Washington state or elsewhere are there really large unit collections for the area, nor have large collections been assembled by borrowing for purposes of refined taxonomic work. The point to be made especially is that a great deal more collecting still needs to be done in Washington followed by painstaking analysis of the variation that the specimens show.—Alden H. Miller.

COOPER SOCIETY MEETINGS

SOUTHERN DIVISION

February.—The monthly meeting of the Southern Division of the Cooper Ornithological Society was held on February 23, 1954, at the Los Angeles County Museum, Los Angeles. The following names were proposed for membership: Mrs. Cora Baker, 5111 42nd Ave., Sacramento, Calif., by Wm. K. Kirscher; Katharine T. Coakley, Mariposa, Calif., by Junea W. Kelly; Victor Lewin, Museum of Vertebrate Zoology, University of California, Berkeley 4, Calif., by Carl B. Koford; Mrs. Harold Rosegay, 216 Los Gallinas Ave., San Rafael, Calif., by Lois C. Stone; Ken Legg, 173 Plateau Ave., Santa Cruz, Calif., and Dr. Fred A. Ryser, Jr., Biology Dept., Univ. of Nevada, Reno, Nev., by Francis H. Boynton; Jackson Miles Abbott, 814 13th St., New Alexandria, Va., Frank C. Bellrose, Ill. Nat. Hist. Surv., Havana, Ill., Samuel Gasparec, Box 88, Homer, Alaska, Frank E. Horn, 538 East 21st St., Brooklyn 26, N.Y., Mrs. J. L. McBride, 2224 Via Guadalana, Palos Verdes Estates, Calif., Frank P. McConoughey, 1547 Northland Ave., Lakewood 7, Ohio, Dr. J. A. Sealander, Jr., Zoology Dept., Univ. of Arkansas, Fayetteville, Ark., and Mrs. Charles W. Vanek, 7441 Rewter Ave., Dearborn 1, Mich., all by C. V. Duff.

Due to an unexpected vacancy in the office of second vice-president, the Nominating Committee presented the name of Robert L. Taylor for the office. There being no further nominations from the floor it was duly moved and seconded that the nominations be closed and that the secretary be instructed to cast an unanimous ballot as proposed. Motion carried and Dr. Taylor was declared elected to fill the office of second vice-president.

The evening's program entitled "Bush Noises" was given by Raymond B. Cowles. The lecture was illustrated with colored slides of African birds, animals and scenery, and with tape recordings.—Dorothy E. Groner, *Secretary*.

COOPER ORNITHOLOGICAL SOCIETY, INC.
STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS
FOR THE YEAR ENDING DECEMBER 31, 1953

CASH IN BANK, DECEMBER 31, 1952			$9,989.35
ADD: CASH RECEIPTS			
General Publication Fund			
Membership dues, regular and sustaining	$5,087.69		
Subscriptions for the Condor	863.75		
Condor sales	605.65		
Phonograph record sales (14 records sold)	107.20		
Dividends and interest received on endowment funds invested (Note A)	2,103.57		
Contributions received for publication of the Condor	100.00		
Other cash receipts	51.82	$8,919.68	
Avifauna Fund			
Avifauna sales (net) (Note B)	$326.92		
Sales tax collected on Avifauna sales $11.26, less $9.43 disbursed to state with 1952 sales tax return	1.83		
Contributions	2,000.00	2,328.75	
Endowment Fund			
Life memberships and installment payments received on life memberships	$670.00		
Contributions	243.36	913.36	12,161.79
			$22,151.14
DEDUCT: CASH DISBURSEMENTS			
General Publication Fund			
Publication costs of the Condor			
Printing	$6,016.17		
Engraving	573.12		
Purchases of back issues	438.90	$7,028.19	
Cost of phonograph records		27.61	
Administrative expenses			
Northern division	$80.23		
Southern division	62.77		
Annual meeting	115.55		
Accounting	172.63		
Business manager	376.43		
Treasurer	200.71		
Editor	26.20	1,034.52	
Endowment Fund			
Purchase of 43 shares of El Paso Natural Gas Co. stock		1,399.63	9,489.95
CASH IN BANK, DECEMBER 31, 1953			$12,661.19

CASH IN BANK ALLOCATED TO FUNDS AS FOLLOWS:

	December 31, 1952	December 31, 1953
General Publication Fund	$7,840.56	$8,669.92
Grayson Fund	213.66	213.66
Avifauna Fund	985.24	3,313.99
Endowment Fund	949.89	463.62
	$9,989.35	$12,661.19

NOTE A: At December 31, 1953, the business manager had in his custody endowment funds invested in corporate stocks which cost $26,521.92 and had a market value of $46,170.21, and a $100.00 U. S. Treasury Bond with a market value of $102.15. This endowment fund includes the contributions received in the names of Louis B. Bishop, Florence M. Bailey, Harry R. Painton, Joseph Grinnell and Albert E. Colburn.

NOTE B: At December 31, 1953, the Society had a stock of Avifaunas for which the total of the quoted list prices was $25,522.00, and had shipped Avifaunas worth $156.40 for which payment had not been received.

C. V. DUFF, *Business Manager*

Concerning Cooper Society Memberships and Subscriptions

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***For Sale, Exchange, and Want Column*—Each member of the Cooper Society is entitled to one short advertising notice in any issue of the Condor free. Notices of over 3 lines will be charged for at the rate of 25 cents per line. Send advertising copy to Jack C. von Bloeker, Jr.**

For Sale—Birds of North America, by Baird, Cassin and Lawrence (1860, text only), $6.50; Check-list of North American Birds, by Coues (1873), $6.00; Ornithology of Southern Texas, by Merrill (autographed copy), $3.50; English Sparrow, by Barrows, $2.50; Taxidermy, by Hornaday, $4.25; Ornithological Cross-section of Illinois, by Forbes, $1.25; Winter Bird-life of Minnesota, by Roberts, $1.25; Revision of American Voles of the Genus Microtus, by Bailey (North American Fauna No. 17), $2.50; 25 U.S.D.A. Bird Bulletins bound in one volume (list on request), $10.00; all items postpaid.—William Adams, *8023 Sycamore St., New Orleans 18, La.*

For Sale—The Auk, vols. 49–70, inclusive, $50.00.—Charles G. Sibley, *Dept. of Conservation, Cornell University, Ithaca, N.Y.*

For Sale—Biota of the San Bernardino Mountains, by Joseph Grinnell (autographed copy; cover somewhat damaged and bears signature of M. French Gilman, $4.00 postpaid. This book was donated to the society for sale and the proceeds are to be deposited in the Pacific Coast Avifauna Fund.—Thomas R. Howell, *Assistant Business Manager, Cooper Ornithological Society, % Dept. of Zoology, University of California, Los Angeles 24, Calif.*

Wanted—Check-list of Birds of the World, volume 5, by James L. Peters. Please state price and condition.—Arthur Aronoff, M.D., *University Hospital, Ann Arbor, Mich.*

Binocular Information—For an easy simplified way to check alignment of a binocular, see our article in the January–February Audubon Magazine. Also, read "Know Your Binoculars," previously published by us in the Audubon Magazine, to learn how to choose the model best suited for your purpose and how to obtain the most use from it; fully illustrated reprint 10¢ (no charge to members of Cooper Ornithological Society). If your binocular is in need of repair or coating, send it to us for a free estimate; if you need a new one, request our list of American, German and Japanese glasses, all guaranteed adjusted to U. S. Government specifications and sent on 20 days' free trial; liberal trade-in allowance. We personally answer questions and check glasses without charge. If you have a binocular problem, let us help you solve it.—The Reicherts, *Mirakel Repair Co., Mount Vernon 15, New York.*

For Sale—The "Tiny Tucker" Hummingbird Feeder, complete with instructions for use, $1.00 plus 15¢ postage; all profits realized to be used for maintenance of the Tucker Bird Sanctuary.—Arnold Lane, *Box 53, Star Route, Modjeska Canyon, Orange, Calif.*

Wanted—2-inch by 2-inch color slides of birds of the western United States. Please state price.—C. J. Parker, *821 N. Garfield Ave., Alhambra, Calif.*

For Sale—Introduction to Ornithological Nomenclature, by Mary Ferguson Coble (1954, revised), paper cover, 96 pp., $1.50 each (a dictionary of scientific names based on structure, color, markings, habitat, characteristics, food, geographic locations, and patronyms).—Helen S. Pratt, *2451 Ridgeview Ave., Los Angeles 41, Calif.*

Wanted—The Condor, vol. 1, nos. 3–4; vol. 2, no. 6; and vol. 3, no. 2.—Jack C. von Bloeker, Jr., *Los Angeles City College, Los Angeles 29, Calif.*

LIFE HISTORIES OF CENTRAL AMERICAN BIRDS

FAMILIES FRINGILLIDAE, THRAUPIDAE, ICTERIDAE, PARULIDAE and COEREBIDAE

By ALEXANDER F. SKUTCH

The Cooper Ornithological Society has recently published the Life Histories of Central American Birds as Pacific Coast Avifauna No. 31.

This volume contains life histories of 40 species of birds of Central America belonging to the higher families of song birds—the finches, tanagers, troupials, wood warblers, and honeycreepers. The accounts are the work of a skilled, sensitive and patient naturalist who has devoted a quarter of a century of outdoor work to the intensive study of the varied and complex bird life of the mountains and lowlands of Latin America. All but two of the accounts are heretofore unpublished and for each of the five families a summary and a comparison of the highlights of the breeding biology of the species are given.

Dr. Skutch, the author, was trained in botany at Johns Hopkins University. In 1928 he first visited the American tropics in Panama. There soon grew in him a determination to devote his life to learning all he could of the habits of the birds of Central America. Botanical jobs and finances were always adapted to the fullest possible pursuit of this goal in bird study. After work in Honduras and Guatemala, Dr. Skutch settled in Costa Rica in 1941 on his own farm in the wild and isolated section of El General. In support of this particular writing he received a fellowship from the Guggenheim Foundation, and in 1950 he was awarded the Brewster Medal of the American Ornithologists' Union for his publications on Central American birds.

The book consists of 448 pages, and it is illustrated by Don R. Eckelberry. A group of four tanagers is shown in color and all the other species are represented by line drawings. Thirty-two photographs show nests and habitats of tropical America.

Pacific Coast Avifauna Number 31 is available at the following prices:

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